


LIGHT LEAKAGE PREVENTIVE DEVICE AND SELF-LUMINOUS DISPLAY DEVICE FORMED BY USING THE SAME

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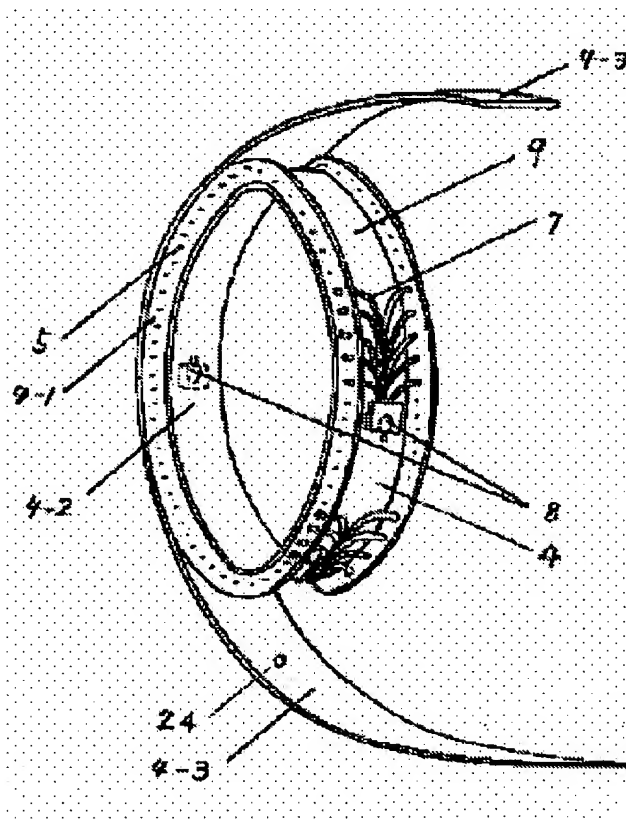
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Abstract of JP8171352

PURPOSE: To suppress loss of light, to miniaturize an apparatus and to make it possible to rapidly and visibly recognize the presence of a display, such as fire hydrant signals, etc., by using light leakage preventive means at the time of transmitting the light of light emitting diodes to many adjacent optical fibers. **CONSTITUTION:** This device consists of an enclosure 4 which consists of a pair of semicylindrical bodies provided with first and second supporting pieces 4-1 disposed at both ends, a first panel which is fixed to the first supporting piece 4-1 of this enclosure 4, is provided with plural through-holes 5 over the circumferential edge and is provided with a signal display part, a second panel which is fixed to the second supporting piece of the enclosure 4, a housing section 9 which is formed of the enclosure 4 and the first and second panels, the optical fibers 7 which are housed in this housing section 9 and are respectively inserted and fixed at their one-side ends into the through-holes 5 provided in the first or the second panel and the light emitting diodes 8 which are housed in the housing section 9, disposed adjacently to the other end edges of the bundles formed by bundling the other-diode ends of plural pieces of the optical fibers 7 to each other and cutting these ends and have light leakage preventive means.



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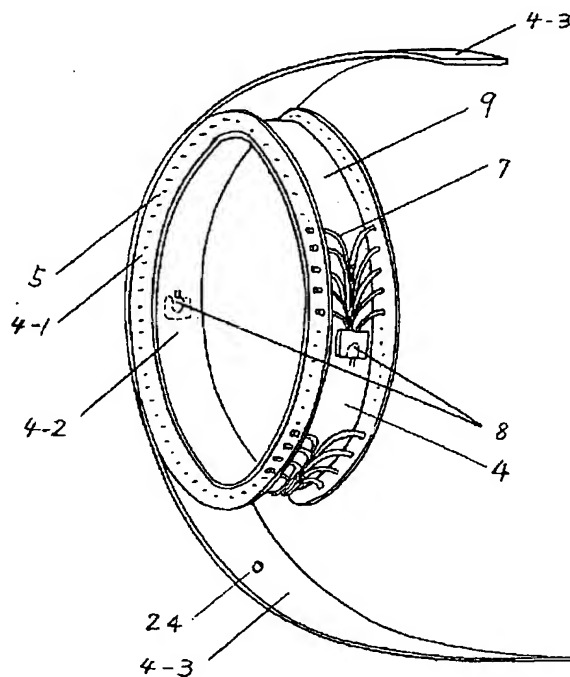
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(54) 【発明の名称】 光漏洩防止装置とそれを用いる自発光表示装置

(57) 【要約】 (修正有)

【目的】 発光ダイオードの光を隣接の多数の光ファイバーに伝送する際、光漏洩防止手段を用いることにより光の損失を抑制し、機器を小型化し、また消火栓標識等の表示の存在を速やかに視認可能にする。

【構成】 両端に配設される第1第2支持片4-1が設けられた一対の半筒状体の包囲体4と、この包囲体の第1支持片に固定されると共に周縁にわたって複数の透孔5が設けられ且つ標識表示部が設けられた第1パネルと、包囲体の第2支持片に固定される第2パネルと、包囲体と第1第2パネルとより形成される収納部9と、この収納部に収納され且つその一端が第1あるいは第2パネルに設けられた透孔にそれぞれ挿入固定される光ファイバー7と、この収納部に収納され且つ複数個の光ファイバーの他端を互いに集束して切断した集束他端縁に隣接して配設され且つ光漏洩防止手段を備える発光ダイオード8とからなる。



【特許請求の範囲】

【請求項 1】 貫通孔の内周面に光反射材を備える合成樹脂製ホルダと、該貫通孔に接着剤にて接着固定される複数個の光ファイバー束と、前記貫通孔に挿入固定された光ファイバー束の端縁の対向位置に光拡散のための所定の微小間隙をもって且つ該貫通孔内に挿入固定される発光ダイオードとを備える光ファイバーと発光ダイオードの接続用光漏洩防止装置。

【請求項 2】 光反射材は無電解メッキである請求項 1 に記載の光漏洩防止装置。

【請求項 3】 光反射材は貫通孔の内周面に挿入される反射シートである請求項 1 に記載の光漏洩防止装置。

【請求項 4】 光反射材は貫通孔の内周面に挿入されるアルミ等の金属薄板である請求項 1 に記載の光漏洩防止装置。

【請求項 5】 少なくとも 1 個の貫通孔が設けられた合成樹脂製ファイバーホルダと、該貫通孔に挿入固定される複数個の光ファイバー束と、前記貫通孔に挿入固定された光ファイバー束の端縁の対向位置に少なくとも 1 個の貫通孔が設けられ且つ該貫通孔の内周面に光反射材を備える合成樹脂製発光ダイオードホルダと、該発光ダイオードホルダの貫通孔に挿入固定される発光ダイオードと、前記ファイバーホルダと発光ダイオードホルダとを締めつけ固定する固定手段とを備える光ファイバーと発光ダイオードの接続用光漏洩防止装置。

【請求項 6】 ファイバーホルダの貫通孔の内周面に光反射材を備える請求項 5 に記載の光漏洩防止装置。

【請求項 7】 光反射材は無電解メッキである請求項 5 或るいは 6 に記載の光漏洩防止装置。

【請求項 8】 光反射材は反射シートである請求項 5 或るいは 6 に記載の光漏洩防止装置。

【請求項 9】 光反射材はアルミ等の金属薄板である請求項 5 或るいは 6 に記載の光漏洩防止装置。

【請求項 10】 ファイバーホルダと発光ダイオードホルダとの間に遮光兼光反射用パッキングを介在させた請求項 5、6、7、8 或るいは 9 に記載の光漏洩防止装置。

【請求項 11】 発光ダイオードはプリント基板上の銅箔に半田付け固定されている請求項 5、6、7、8、9 或るいは 10 に記載の光漏洩防止装置。

【請求項 12】 発光ダイオードの前端面と光ファイバーの端縁の対向面間に光拡散のための所定の微小間隙を設けてなる請求項 5、6、7、8、9、10 或るいは 11 に記載の光漏洩防止装置。

【請求項 13】 固定手段はボルトとナットよりなる請求項 5、6、7、8、9、10、11 或るいは 12 に記載の光漏洩防止装置。

【請求項 14】 (a) 内方側の両端に相対向して配設される防水兼用第 1 第 2 支持片が設けられた一対の半筒状体を相対向組合わせて形成される包囲体と、(b) 該包囲体

の前記第 1 支持片に固定されると共に周縁にわたって複数の透孔が設けられ且つ標識表示部が設けられた第 1 パネルと、(c) 前記包囲体の前記第 2 支持片に固定される第 2 パネルと、(d) 前記包囲体と前記第 1 第 2 パネルとより形成される収納部と、(e) 該収納部に収納され且つその一端が前記第 1 あるいは第 2 パネルの少なくとも一方に設けられた複数個の透孔にそれぞれ挿入固定される複数個の光ファイバーと、(f) 該収納部に収納され且つ前記複数個の光ファイバーの他端を互いに集束して切断した集束他端縁に隣接して配設され且つ光漏洩防止手段を備える発光ダイオードと、(g) 該発光ダイオードの供給用電源と、(h) 前記包囲体或るいは第 2 パネルに装着され且つ該包囲体或るいは第 2 パネルに固定される取付け金具とを備える自発光表示装置。

【請求項 15】 (a) 筒状体の両端に配設され且つ複数個の透孔の設けられた相対向する第 1 第 2 支持片を具備する包囲体と、(b) 前記筒状体と前記第 1 第 2 支持片より形成される凹陷収納部と、(c) 該凹陷収納部に収納され且つその一端がそれぞれ前記第 1 あるいは第 2 支持片の少なくとも一方の複数個の透孔に挿入固定される複数個の光ファイバーと、(d) 前記凹陷収納部に収納され且つ前記ファイバーの他端に隣接して配設され且つ光漏洩防止手段を備える発光ダイオードと、(e) 該発光ダイオードの供給用電源と、(f) 前記凹陷収納部を施蓋する施蓋体と、(g) 前記施蓋体あるいは包囲体に装着され且つ該施蓋体或るいは包囲体を固定する取付け金具とを備える消火栓等の標識明示用の自発光表示装置。

【請求項 16】 前記筒状体を延長した延長部及び前記施蓋体の少なくとも一方が前記支持片の透孔から突出した光ファイバーの一端縁よりも少許突出する程度に設定された請求項 15 に記載の自発光表示装置。

【請求項 17】 前記発光ダイオードの光漏洩防止手段は該ダイオードの被覆側面に施された無電解メッキである請求項 14、15 或るいは 16 に記載の自発光表示装置。

【請求項 18】 前記光ファイバーと該光ファイバーの集束他端縁に隣接して配設される発光ダイオードの光漏洩防止手段は請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置である請求項 14、15 或るいは 16 に記載の自発光表示装置。

【請求項 19】 前記供給用電源は前記包囲体或るいは前記第 2 パネルに設けられた太陽電池架上に装着される太陽電池である請求項 14 に記載の自発光表示装置。

【請求項 20】 前記供給用電源は前記施蓋体、前記包囲体、及び予め別に設けられた近接固定体の内のいずれか一つに装着される太陽電池架に配設された太陽電池である請求項 15 に記載の自発光表示装置。

【請求項 21】 前記収納部に収納された蓄電池を交換するための取外孔が前記第 2 パネルに設けられ且つ前記

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取付け金具が該取外孔に対向する位置に設けられた請求項 14、17、18 或るいは 19 に記載の自発光表示装置。

【請求項 22】 前記収納部内に蓄電池、点滅回路が内蔵される請求項 14、17、18、19 或るいは 21 に記載の自発光表示装置。

【請求項 23】 前記太陽電池架内に蓄電池、点滅回路が内蔵される請求項 15、16、17、18 或るいは 20 に記載の自発光表示装置。

【請求項 24】 前記取付け金具にて前記施蓋体或るいは包囲体を既設の消火栓標識板取り付けアームに取り付け自在にしたことを特徴とする請求項 15、16、17、18、20 或るいは 23 に記載の自発光表示装置。

【請求項 25】 (a) 複数個の透孔が設けられ且つ相対向して所定の間隔で配設される第 1 保持板及び第 2 保持板と、(b) 前記第 1 保持板の内面近傍に沿って略並行に配設され、且つ所定の曲率をもって曲げられ一端が前記第 2 保持板のそれぞれの透孔に貫挿される第 1 光ファイバーと、(c) 前記第 2 保持板の内面近傍に沿って略並行に配設されると共に前記第 1 光ファイバーと交差するように配設され、且つ所定の曲率をもって曲げられ一端が前記第 1 保持板のそれぞれの透孔に貫挿される第 2 光ファイバーと、(d) 前記第 1 第 2 光ファイバーの他端に隣接して配設される発光ダイオードと、(e) 該発光ダイオードの供給用電源とを備える自発光表示装置。

【請求項 26】 前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 25 に記載の自発光表示装置。

【請求項 27】 (a) 複数個の透孔が設けられた保持板と、(b) 前記保持板の透孔に一端が貫挿される光ファイバーと、(c) 前記保持板に該光ファイバーを接着固定するために、該光ファイバーの貫挿される前記保持板の透孔の周囲及び該光ファイバーの周縁に塗布される接着剤と、(d) 前記光ファイバーの他端に隣接して配設される発光ダイオードと、(e) 該発光ダイオードの供給用電源と、を備え、前記保持板に固定された前記光ファイバーの一端から所定の位置で前記光ファイバーを外圧力により所定の曲率をもって曲げ、前記光ファイバーの前記外部圧力による曲げ部分を所定時間加熱して、前記外部圧力による光ファイバーの曲げ部分の曲げ歪みによるストレスを低減させてなる自発光表示装置。

【請求項 28】 前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 27 に記載の自発光表示装置。

【請求項 29】 (a) 複数個の透孔が設けられた保持板と、(b) 予め所定時間の加熱保温により一端から所定の位置で所定の曲率をもって曲げられ且つ一端が前記保持板の透孔に貫挿される光ファイバーと、(c) 前記光ファイバーの他端に隣接して配設される発光ダイオードと、(d) 該発光ダイオードの供給用電源と、を備える自発光表示装置。

【請求項 30】 前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 29 に記載の自発光表示装置。

【請求項 31】 前記光ファイバーの直径を d 、光ファイバーの曲げ半径を r とすると、 $70d \leq r < 100d$ の曲率をもって光ファイバーを曲げることを特徴とする請求項 27、28、29、或るいは 30 に記載の自発光表示装置。

【請求項 32】 前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 31 に記載の自発光表示装置。

【請求項 33】 (a) 所定の距離を隔てて或は直接添着して補助板を配設し且つ複数個の透孔が該補助板にも設けられた保持板と、(b) 前記保持板の透孔に一端が貫挿される光ファイバーと、(c) 前記光ファイバーの他端に隣接して配設される発光ダイオードと、(d) 該発光ダイオードの供給用電源と、を備え、保持板の外表面から補助板の外表面までの距離を D 、光ファイバーの直径を d とする時、 $D \geq 4d$ なるようにした自発光表示装置。

【請求項 34】 前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 33 に記載の自発光表示装置。

【請求項 35】 前記補助板は保持板と略同じ熱膨張係数を有することを特徴とする請求項 33 に記載の自発光表示装置。

【請求項 36】 前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 35 に記載の自発光表示装置。

【請求項 37】 前記包囲体の下部に排水孔を設けた請求項 14 或るいは 15 に記載の自発光表示装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、光ファイバーと発光ダイオードとの接続用光漏洩防止装置とそれを用いる自発光表示装置に関するものである。更に詳説すると、接続用光漏洩防止装置に関しては、発光源に発光ダイオードを使用し、その発光ダイオードに近接して光ファイバーの一端を配置し、発光ダイオードの光を光ファイバーを介して伝送し、光ファイバーの他端の発光点へ光を伝送する際に用いて好適な光ファイバーと発光ダイオードとの接続用光漏洩防止装置を提供するものであり、特に、発光ダイオードと光ファイバーとの接続個所における光の損失を減少できる技術を提供するものであり、更に、自発光表示装置に関しては、発光源に発光ダイオードを使用し、発光ダイオードから表示部上の発光点への光の伝送に光ファイバーを用いた自発光表示装置に関するものである。また、本発明は光ファイバーを折り曲げる曲率を小さくして、光ファイバーを保持するパネル或いは支持片等の保持板間の距離を狭くし、自発光表示装置の構造を薄くする技術を提供するものであり、更に、また、本発明は消火栓等の標識明示用の自発光表示装置が倒れた場合にも、支持片やパネル等の保持板の透孔に挿通された光ファイバーの先端が破損するのを防止するため、光ファイバーに隣接する部分を光ファイバーの先端よりも少許突出させる技術を提供するものである。また、本発明は自発光表示装置の包囲体の下部に排水孔を設けて雨水を排水できる技術を提供するものである。また、本発明は発光ダイオードの供給用電源としては商用交流電源を使用することもできるが、太陽電池を発光ダイオードの供給用電源として使用して好適な自発光表示装置を提供するものである。

【0002】一般に、消火活動では、その初期行動時間の短縮が消防作業の結果を左右するため、視界の悪い状況で消防士を正しく早く消火栓に誘導することが極めて重要となっている。又、近年自動車の普及に伴い、駐車スペース確保の困難さから、かりに早期に消火栓が見出されても、その消火栓位置の上に自動車が駐車されている場合も多くあるため、運転者にも注意を喚起し、消火栓の外側或いは消火栓に通じる道路の外側の位置に駐車させるよう誘導することも重要となっている。

【0003】

【従来の技術】従来、消火栓の標識には何ら照明が施されていない場合が多く、夜間、視界の悪い状況で消防士が消火栓を見つけるのは困難である。

【0004】また、従来、交通標識（ストップ、進入禁止、左折禁止、右折禁止、駐車禁止等の表示）や一般の広告表示看板等の照明表示には白熱電灯、蛍光灯、ネオン灯或いは多数の発光ダイオード（LED）による表示が行われているが、これらの表示には多くの電力を要する。従って、商用交流電源が近くにある場合にはその電源から白熱電灯、蛍光灯、ネオン灯やLEDの電源を

供給すればよいが、離れ島や発展途上国等においては商用交流電源の設備がないため、必要などに交通標識や広告塔等を設置するには小型の発電設備を設ける必要があり、多額の経費が必要であった。

【0005】このような問題を解決するため、従来、特開昭63-205689号（G09F, 13/00）に示されているような発光ダイオードと光ファイバーとを使用する標識表示の技術が提案されている。このような従来技術では、発光ダイオードと光ファイバーとの接続個所において、発光ダイオードの光がそのダイオードと対向する複数個の光ファイバー束の端縁以外に漏洩して光の損失が生じる。この光の損失を少しでも抑制するため、発光ダイオードの端面に複数個の光ファイバー束の端縁を直接当接させると、発光ダイオードの端面は曲率を持っているので、光ファイバー束の端縁面の中心部付近のみで発光ダイオードの端面に当接し、光ファイバー束の中心部の輝度は高いが、周辺部は輝度が低くなり、従って、表示文字や図表に輝度むらが発生するという問題があった。

【0006】また、屋外に設置される交通標識、広告看板等は強い風雪、風雨、高温、高湿、或いは極寒の厳しい環境等様々な状況に晒されるが、従来、それ等に対する対策は何もなされていない。また、従来、これ等の装置に装着されている部品の交換や盗難対策について何も考慮されていないまた、従来、消火栓標識の視認性を向上させるため、消火栓標識板円周に沿って、標識板に直接或いは、間接的に発光ダイオードを取付けた自発光型誘導標などが用いられているが、これらはいずれも一つの発光点に直接一つの発光ダイオードが用いられているため、発光点の数だけ発光ダイオードが必要となる。具体的には直径646（mm）の円周に、約118（mm）のピッチで、16個の発光ダイオードを取付けた場合、発光ダイオードの消費電力は約0.6（w）となり、夜間における点灯、消灯の時間割合が、点灯1、消灯2程度としても、約3（w）の出力の太陽電池が必要となる。現在市販されている太陽電池モジュールでは、220×200（mm）程度のサイズとなり、直径約650（mm）の誘導標に対して余りにも大掛りとなり過ぎ、又、太陽電池の価格（1（w）当り1500～2000円）から考えても経済性に乏しい。このように、発光ダイオードの使用個数が増えれば、太陽電池だけでなく、蓄電池の消費電力も大きくなり、全体としてコストが高くなり、実用性に欠ける。

【0007】また、光ファイバーを保持するパネル或いは支持片等の保持板を相対向して配置し、両保持板の内面から両保持板に光ファイバーを保持する場合、光ファイバーは或る曲率以上に曲げると、その内部に歪みを起こし、光の伝達効率が低下するので、光ファイバーの折り曲げ曲率の関係から所定の距離以下に両保持板の間隔を狭くすることができず、従って、自発光表示装置の

構造は相当大きいものであった。

【0008】更に、また、消火栓等の標識明示用の自発光表示装置が倒れた場合に、支持片やパネル等の保持板の透孔に挿通された光ファイバーの先端が破損するという問題があった。

【0009】また、自発光表示装置の包囲体の内部に水が溜り、障害を起こすという問題もあった。

【0010】また、照明用の発光源の装着されていない既設の消火栓の標識や交通標識の場合には、照明をしようとすれば、新たに照明装置付きの自発光表示装置を設置しなければならないという問題がある。

【0011】

【発明が解決しようとする課題】本発明は、前記問題に鑑みてなされたものであり、照明用の発光源の装着されていない従来の既設の消火栓の標識や交通標識の場合にも、既設の消火栓の標識や交通標識をそのまま使用し、しかも、簡単な装置で照明ができる消火栓等の標識明示用の自発光表示装置を提供することである。

【0012】また従来、発光ダイオードと光ファイバーとの接続個所においては光の漏洩損失が生じていたが、この発光ダイオードと光ファイバーとの接続個所における光の漏洩損失を減少させ、消費電力の損失を減少させることである。

【0013】また、従来の自発光表示装置では、多数の発光ダイオードを使用することによる消費電流の増加に伴い、容量の大きい太陽電池及び蓄電池が必要となり、全体としてコストが高くなり、その結果経済性・実用性に欠けるという難点があったが、本発明は消費電力の少ない表示装置を提供することである。

【0014】また、本発明は光ファイバーを保持するパネル或いは支持片等の保持板を相対向して配置し、両保持板の内面から両保持板に光ファイバーを保持する場合、光ファイバーを或る曲率以上に曲げても、内部に歪みを起こさず、従って、光の伝達効率の低下を起こさないようにして、所定の距離以下に両保持板の間隔を狭くし、自発光表示装置の構造を小型化させることである。

【0015】更にまた、屋外表示看板、交通標識或いは消火栓標識等は強い風雪、風雨、高温、高湿或いは寒冷の厳しい環境等様々な状況に置かれるので、本発明はそれ等に対する防護を量ることである。

【0016】ニッケル・カドミウム等の蓄電池は400～500回の充電放電を繰り返すと、急速に充電性能が劣化してしまうので、約1年半～2年に1度は蓄電池を交換する必要がある、この蓄電池の交換の容易さと共に蓄電池等の部品の盗難を防止することである。

【0017】また、光ファイバーを保持するパネル或いは支持片等の保持板を相対向して配置し、両保持板の内面から両保持板に光ファイバーを保持する場合、光ファイバーは或る曲率以上に曲げると、内部に歪みを起こ

し、光の伝達効率が低下するので、光ファイバーの折り曲げ曲率の関係から所定の距離以下に両保持板の間隔を狭くすることができず、従って、自発光表示装置の構造を小型化できないという問題があるが、本発明は光の伝達効率を低下させることなく、しかも光ファイバーの折り曲げ曲率を大きく出来る技術を提供することである。

【0018】更に、また、消火栓等の標識明示用の自発光表示装置が倒れた場合に、支持片やパネル等の保持板の透孔に挿通された光ファイバーの先端が破損するという問題があるが、このような問題を解決できる技術を提供することである。

【0019】また、自発光表示装置の包囲体の内部に水が溜り、障害を起こすという問題を解決できる技術を提供することである。

【0020】

【課題を解決するための手段】本発明の発光ダイオードと光ファイバーの光漏洩防止装置においては、貫通孔の内周面に無電解メッキや反射シート等の光反射材が設けられている合成樹脂製ホルダと、そのホルダの貫通孔内に接着剤にて接着固定される複数個の光ファイバー束と、この貫通孔に挿入固定された光ファイバー束の対向位置に光拡散のための所定の微小間隙をもって且つこの貫通孔内に挿入固定される発光ダイオードとから構成されている。

【0021】他の実施例の光漏洩防止装置では、複数個の貫通孔が設けられた合成樹脂製ファイバーホルダと、そのホルダの貫通孔に挿入固定される複数個の光ファイバー束と、複数個の貫通孔が設けられ且つその貫通孔の内周面に無電解メッキや反射シート等の光反射材が設けられている合成樹脂製発光ダイオードホルダと、その発光ダイオードホルダの貫通孔に挿入固定される発光ダイオードと、前記ファイバーホルダと発光ダイオードホルダとを締めつけ固定する固定手段とから構成されている。

【0022】更に他の実施例では前述の光漏洩防止装置において、更に、光ファイバーホルダと発光ダイオードホルダの間に介在される遮光兼光反射用パッキングが設けられている。

【0023】本発明の自発光表示装置は、(a)内方側の両端に相対向して配設される防水兼用第1第2支持片が設けられた一対の半筒状体を対向組合わせて形成される包囲体と、(b)この包囲体の第1支持片に固定されると共に周縁にわたって複数の透孔が設けられ且つ標識表示部が設けられた第1パネルと、(c)前記包囲体の第2支持片に固定される第2パネルと、(d)前記包囲体と前記第1第2パネルとより形成される収納部と、(e)この収納部に収納され且つその一端が前記第1あるいは第2パネルの少なくとも一方に設けられた複数個の透孔にそれぞれ挿入固定される複数個の光ファイバーと、(f)この収納部に収納され且つ前記複数個の光ファイバーの他端

を互いに集束して切断した集束他端縁に隣接して配設され且つ光漏洩防止手段を備える発光ダイオードと、(g) この発光ダイオードの供給用電源と、(h) 前記包囲体或るいは第 2 パネルに装着され且つこの包囲体或るいは第 2 パネルに固定される取付け金具とからなる。

【0024】本発明の他の実施例である消火栓等の標識明示用の自発光表示装置は、(a) 筒状体の両端に配設され且つ複数個の透孔の設けられた相対向する第 1 第 2 支持片を具備する包囲体と、(b) 前記筒状体と前記第 1 第 2 支持片より形成される凹陥収納部と、(c) 該凹陥収納部に収納され且つその一端がそれぞれ前記第 1 あるいは第 2 支持片の少なくとも一方の複数個の透孔に挿入固定される複数個の光ファイバーと、(d) 前記凹陥収納部に収納され且つ前記ファイバーの他端に隣接して配設され且つ光漏洩防止手段を備える発光ダイオードと、(e) 該発光ダイオードの供給用電源と、(f) 前記凹陥収納部を施蓋する施蓋体と、(g) 前記施蓋体あるいは包囲体に装着され且つ該施蓋体或るいは包囲体を固定する取付け金具とから構成される。

【0025】本発明の更に他の実施例の自発光表示装置は、前記発光ダイオードの光漏洩防止手段が前述の光漏洩防止装置から構成されたり、或るいは発光ダイオードの被覆側面に施された無電解メッキより構成される。

【0026】本発明のまた他の実施例の自発光表示装置は、前記供給用電源が前記包囲体或るいは前記第 2 パネルに設けられた太陽電池架上に装着される太陽電池からなっている。

【0027】本発明の更に他の実施例の自発光表示装置は、前記供給用電源が前記施蓋体或るいは支持片に設けられた太陽電池架上に装着される太陽電池からなっている。

【0028】本発明の他の実施例の自発光表示装置においては、更に、前記収納部に収納された蓄電池を交換するために第 2 パネルに設けられた取外孔と、該取外孔に対向する位置に設けられる前記取付け金具とが追加構成されている。

【0029】本発明の更に他の実施例の自発光表示装置は、前記収納部内に内蔵される蓄電池、点滅回路が備えられている。

【0030】本発明の更に他の実施例の自発光表示装置は、前記太陽電池架内に内蔵される蓄電池、点滅回路が備えられている。

【0031】本発明の更に他の実施例である消火栓等の標識明示用の自発光表示装置は、前記施蓋体或るいは包囲体を既設の消火栓標識板取り付けアームに自在に取り付け取り付けられるように形成された前記取付け金具を備えている。

【0032】本発明の更に他の実施例の自発光表示装置は、(a) 複数個の透孔が設けられ且つ相対向して所定の間隔で配設される第 1 保持板及び第 2 保持板と、(b) 前

記第 1 保持板の内面近傍に沿って略並行に配設され、且つ所定の曲率をもって曲げられ一端が前記第 2 保持板のそれぞれの透孔に貫挿される第 1 光ファイバーと、(c) 前記第 2 保持板の内面近傍に沿って略並行に配設されると共に前記第 1 光ファイバーと交差するように配設され、且つ所定の曲率をもって曲げられ一端が前記第 1 保持板のそれぞれの透孔に貫挿される第 2 光ファイバーと、(d) 前記第 1 第 2 光ファイバーの他端に隣接して配設される発光ダイオードと、(e) 該発光ダイオードの供給用電源とから構成されている。

【0033】本発明の更に他の実施例の自発光表示装置は、(a) 複数個の透孔が設けられた保持板と、(b) 前記保持板の透孔に一端が貫挿される光ファイバーと、(c) 前記保持板に該光ファイバーを接着固定するために、前記保持板の内面の該光ファイバーの貫挿される透孔の周囲及び該光ファイバーの周縁に塗布される接着剤と、(d) 前記光ファイバーの他端に隣接して配設される発光ダイオードと、(e) 該発光ダイオードの供給用電源とを備え、前記保持板に固定された前記光ファイバーの一端から所定の位置で前記光ファイバーを外部圧力により所定の曲率をもって曲げ、前記光ファイバーの前記外部圧力による曲げ部分を所定時間加熱して、前記外部圧力による曲げ部分の曲げ歪みによるストレスを低減させる。

【0034】本発明の更に他の実施例の自発光表示装置は、(a) 複数個の透孔が設けられた保持板と、(b) 予め所定時間の加熱保温により一端から所定の位置で所定の曲率をもって曲げられ且つ一端が前記保持板の透孔に貫挿される光ファイバーと、(c) 前記光ファイバーの他端に隣接して配設される発光ダイオードと、(d) 該発光ダイオードの供給用電源とから構成されている。

【0035】本発明の更に他の実施例の自発光表示装置は、前記光ファイバーの直径を d 、光ファイバーの曲げ半径を r とすると、 $70d \leq r < 100d$ の曲率をもって光ファイバーを曲げる。

【0036】本発明の更に他の実施例の自発光表示装置は、(a) 所定の距離を隔てて或は直接添着して補助板を配設し且つ複数個の透孔が該補助板にも設けられた保持板と、(b) 前記保持板の透孔に一端が貫挿される光ファイバーと、(c) 前記光ファイバーの他端に隣接して配設される発光ダイオードと、(d) 該発光ダイオードの供給用電源とを備え、保持板の外表面から補助板の外表面までの距離を D 、光ファイバーの直径を d とする時、 $D \geq 4d$ なるようにしている。

【0037】本発明の更に他の実施例の自発光表示装置は、前記補助板は保持板と略同じ熱膨張係数を有する。

【0038】本発明の更に他の実施例の自発光表示装置は、筒状体を延長した延長部及び施蓋体の少なくとも一方が支持片の透孔から突出した光ファイバーの一端縁よりも少許突出する程度に設定されている。

【0039】本発明の更に他の実施例の自発光表示装置

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は、包囲体の下部に排水孔が設けられている。

【0040】

【作用】本発明の発光ダイオードと光ファイバーとの接続個所においては、合成樹脂製ホルダの貫通孔の内周面に無電解メッキや反射シート等の光反射材が備えられており、或るいは発光ダイオードの側面に無電解メッキの光反射材が付着されているので、発光ダイオードからの発光は光反射材によりすべて貫通孔内に反射され、或るいは発光ダイオードの側面の無電解メッキにより光ファイバー方向に反射されて、光ファイバー内に伝送され、それ故、発光ダイオードと光ファイバーとの接続個所で光が外部に漏洩すること無く、すべて光ファイバーの内部に伝送される。

【0041】本発明の自発光表示装置においては、少数の発光ダイオードとそれに隣接配設されるアクリル製光ファイバーの組合せにより、略単波長に近い光の光点を標識板周縁に沿って、大きく広く配置付設することができるので、その点滅駆動とあいまって、鮮明に消火栓標識の位置を明示でき、誘導効果を向上させることができる。

【0042】本発明の更に他の実施例の自発光表示装置においては、光ファイバーを保持するパネル或るいは支持片等の保持板を相対向して配置し、両保持板の内面から両保持板に光ファイバーを保持する場合、光ファイバー(アクリル)の光学的特性、即ち光伝導度や屈折率が劣化しない範囲で、且つ機械的特性が損なわれない範囲で、光ファイバーを或る曲率で曲げ、両保持板に保持される光ファイバーを交差させて、両保持板の間隔を狭くする。更に、光ファイバーの曲げ曲率を大きくするため、加熱処理を施し、光ファイバー光伝導度や屈折率の劣化を防ぎ、且つ機械的特性が損なわれないようにしている。

【0043】本発明の更に他の実施例の自発光表示装置においては、筒状体を延長した延長部及び施蓋体の少なくとも一方が支持片の透孔から突出した光ファイバーの一端縁よりも少許突出する程度に設定されているので、自発光表示装置が倒れても、光ファイバーの先端が破損する恐れはない。

【0044】本発明の更に他の実施例の自発光表示装置においては、自発光表示装置の包囲体の下部に排水孔が設けられているので、雨水等が溜らない。

【0045】

【実施例】以下、本発明の実施例について、図面に基づいて説明する。

【0046】(第1実施例)図1は本発明の実施例を示す斜視図である。太陽電池モジュール1を固定した太陽電池架2が外径674(mm)の第1、第2支持片(4-1)(4-1)'の上部に支持具3を介して取付けられている。第1、第2支持片(4-1)(4-1)'にはアクリル製光ファイバー突出用の透孔5が設けられており、そ

の透孔5内に直径0.75(mm)の光ファイバー7が計102本配置付設され、支持片(4-1)(4-1)'の外壁から2(mm)突出した状態で約40(mm)間隔にて支持片(4-1)(4-1)'にエポキシ樹脂にて接着固定されている。太陽電池架2には蓄電池及び点滅回路を内蔵させ、又ABS樹脂製内側筒状体(4-2)と第1第2支持片(4-1)(4-1)'より形成される凹陥収納部9に2個の発光ダイオード(直径10(mm))8、8'と、102本の光ファイバー7と、配線などが収納されている。支持片(4-1)(4-1)'の周縁部には、アーム取付金具6が固定されており、そのアーム取付金具6により、既存の消火栓標識板10の取付アーム(11-1)(11-2)(11-3)に取付けることができる。

【0047】図2は内部を説明するための斜視図で、支持片(4-1)(4-1)'を包む帯状の施蓋体4-3で施蓋する様子を示す斜視図である。

【0048】尚、光ファイバー7の後端縁を内側筒状体(4-2)の内壁面側から外壁面側に突出させて点滅させることも出来る。また、筒状体(4-2)と施蓋体4-3の配置を逆にして筒状体(4-2)を外側に、施蓋体4-3を内側に配置することもできる。更にまた、図20に示す如く、筒状体(4-2)の内径を大きくすることにより、アーム取付金具6は筒状体(4-2)の内側に取り付けて置き、アーム取付金具6を既存の消火栓標識板10の外枠に直接取りつけることも出来る。

【0049】図3は一般に使用されている既存の消火栓標識板の斜視図を示す。即ち、支柱12を延長したリング状支柱12aには、取付アーム(11-1)(11-2)(11-3)が溶接固定されており、この取付アーム(11-1)(11-2)(11-3)にボルトとナット13で厚さ約1mmの鉄製の標識板10が固定されている。

【0050】明示用のリング状発光部本体を標識板10に取り付けるには次のようにする。即ち、図1に示す如く、リング状発光部本体の取付金具6により、既存の消火栓標識板10の取付アーム(11-1)(11-2)(11-3)にリング状発光部本体を押付け、一方向(矢印A方向)へ回転させるだけで、取付金具6を取付アーム(11-1)(11-2)(11-3)に装着固定できる。即ち、取付金具6の凹陥部6a内に取付アーム(11-1)(11-2)(11-3)を嵌合させ、取付孔6bにボルトを挿入してナット締めにより取付金具6を取付アーム(11-1)(11-2)(11-3)に固定する。それ故、発光部本体を標識板10に取り付ける据付作業も極めて容易である。着脱の容易さのため、一般街路では勿論、とくに商用電源のない工事現場等に定常的あるいは一時的に設置することができる。

【0051】本発明はこのように極く少数の発光ダイオードを用い、光ファイバーにより任意の立体位置に発光点を拡大配置することにより、標識板10の視認性を高めることができる。本発明者は夜間での視認性を確かめ

るため、光ファイバーの直径、配置間隔、発光ダイオードの消費電流を種々変化させ、夜間 100 (mm) の距離から明るさを目視で比較する実験を行った。その結果、直径 10 (mm) の 5000 (mcd) の発光ダイオード 2 個を用い、上記の配置付設サイズで点滅させることにより、充分明るく視認性に富むことが確かめられた。上記の配置付設条件では、発光ダイオードの消費電力は約 0.07 (w) に低減でき、約 0.4 (W) の出力の太陽電池で賄うことができるため、その経済的効果は大きい。

【0052】 このように低消費電力になったので、20×50 (mm) 程度のサイズの太陽電池を設けるだけでも十分に動作する誘導標が実現し、太陽電池モジュール、蓄電池、点滅回路とリング状発光部本体とが一体的に連結されうるため、誘導標を小型化でき可搬型装置として、既設消火栓標識板 10 に直接、本体取付金具 6 により自在に取付可能となる。又、発光ダイオードと光ファイバーの組合せのため光量の減衰が無視でき、単波長に近い光が点滅するため、誘導作用が顕著であり、発光ダイオード、光ファイバーの特性及び太陽電池の特性の相互作用によって簡単な構成ですぐれた誘導標を得ることができる。

【0053】 さらに上記誘導標は、各種道路標識、番号標示板、広告板、各種誘導標、その他広汎な用途に用いることができ、消防活動、交通安全、商業宣伝などにも大きく寄与するものである。

【0054】 (第 2 実施例) 図 4 は本発明の他の自発光表示装置の斜視図を示し、図 5 は図 4 の (X-X) における断面斜視図、図 6 は図 4 の (X-X) における断面図を示す。図 7 は部品取外孔、部品交換用蓋、取付け金具を組み立てる際の分解斜視図を示す。図 8 は基台に取付け金具を取り付ける際の分解斜視図を示す。図 1、図 2 及び図 3 と対応するものには同じ符号をつけて示す。

【0055】 アルミ製或るいはアクリル等の合成樹脂製の半筒状体 (4-2)' (4-2)" の両端には第 1 第 2 支持片 (4-1)、(4-1)' 及び係合凹部 (4-1 a)、(4-1 a)' が一体に形成されると共に筒状体の上には、太陽電池架 2 が装着されている。アルミ製或るいはアクリル等の合成樹脂製の円板状の消火栓標識表示用の第 1 パネル 15 には文字や記号が表示され、またその文字や記号に沿ってアクリル製の光ファイバー 7 を挿入固定するための透孔 5 が設けられている。アルミ製或るいはアクリル等の合成樹脂製の円板状の第 2 パネル 15' には充電用のニッケル・カドミウム蓄電池 16 等が装着されるが、必要に応じて文字や記号等を表示するためにアクリル製の光ファイバー 7 を挿入固定するための透孔 5 が設けられる。一方の半筒状体 (4-2)' の両端に設けられた係合凹部 (4-1 a)、(4-1 a)' にそれぞれ第 1 及び第 2 パネルの半分の係合固定する。その後、他方の半筒状体 (4-2)" の両端に設けられた係合凹部 (4-1 a)、(4-1 a)' にそれぞれ第 1 及び第 2 パネルの残

り半分の係合固定する。第 1 パネル 15 の内方側には後述の発光ダイオード 8 の接続用光漏洩防止装置 17 が装着される。そして、半筒状体 (4-2)' (4-2)" と第 1 パネル 15 と第 2 パネル 15' により形成される収納部 14 内には、図 18 に示す如く、点滅回路 37、外部の明暗を検出する検出回路 33、その検出出力に応じて発光ダイオード 8 への電源を ON、OFF するスイッチ回路 18 等が収納されている。充電用の蓄電池 16 を交換するために蓄電池が取り外しできる位置に部品取外孔 19 が第 2 パネル 15' に設けられており、部品交換用蓋 20 で部品取外孔 19 を施蓋する。図 7 及び図 8 に示す如く、支柱 12 に本体を取り付けるための取付け金具 21 が第 2 パネル 15' 上にビス 22 a とナット 22 b で固定されており、その位置は支柱 12 が部品交換用蓋 20 に上に丁度来るように設定されている。取付け金具 21 の基台 23 はアルミ製の第 2 パネル 15' 上溶接により固定されている。そして、図 8 に示す如く、基台 23 の L 型金具 23 a、23 b 間の間隙 P はビス 22 a の頭部より狭く、且つそのネジ部の直径より少許広くなっているため、金具 21 のネジ孔 21 a にビス 22 a を挿入した状態で矢印 B 方向から間隙 P に挿入し、ナット 22 b で L 型金具に締め付け固定する。

【0056】 第 1 パネル 15 上には文字或るいは符号に沿って光ファイバーの一端が配設されており、且つパネル面より約 2 mm だけ突出させているので、外部からの視認角度が広がる。更に視認角度を広げたい場合には光ファイバーの先端を鉛筆を削ったように最先端からの開度が約 60 度の角度になるようにすればよい。

【0057】 半筒状体 (4-2)' (4-2)" の係合凹部 (4-1 a)、(4-1 a)' と第 1 パネル 15 と第 2 パネル 15' により形成される収納部 14 は完全に密閉されるので、雨水が収納部内に浸入する恐れはない。尚、内部にもし外気を入れたり、或るいは露水がたまらないようにする必要がある場合には半筒状体 (4-2)' (4-2)" の下方に小さい排水孔 24 を設けてもよい。

【0058】 また、図 21 に示すように、半筒状体 (4-2)' と (4-2)" とを合体接続するため、半筒状体 (4-2)' (4-2)" の内面と略同じ曲率を有する予めに設けられたアルミ製の接続板 40、40' を半筒状体 (4-2)' (4-2)" の内方に当接し、半筒状体 (4-2)' (4-2)" の取付孔 41、41' 及び接続板 40、40' の取付孔 42、42' にハトメ 43、43' を挿入して固定する。また、太陽電池架 2 は太陽電池モジュール 1 を取り付ける前に、太陽電池架 2、半筒状体 (4-2)' (4-2)"、接続板 40、40' を重ねた状態でそれぞれに設けられた取付孔 (図示せず) にハトメ 44、44' (図示せず) を挿入して固定する。

【0059】 また、図 6 及び図 7 にいても、同様に太陽電池架 2 に太陽電池モジュール 1 を取り付ける前に、太陽電池架 2、半筒状体 (4-2)' (4-2)" を重ねた状

態でそれぞれに設けられた取付孔(図示せず)にハトメ 4、4' (図示せず)を挿入して固定する。

【0060】夜間、表示装置を点滅させることにより、(a)視認性が向上し、且つ(b)電気エネルギーの削減効果が得られる。本発明者の実験によれば、0.4~0.6秒点灯させ、0.8~1.2秒位消灯させると、上記(a)(b)を満足させ、実用的であることが分かった。

【0061】図18は本発明に使用する電源回路の一例を示す。太陽電池1の起電圧Eは4.8Vであり、この例では太陽電池を2個直列に接続している。ダイオード35は逆流防止用であり、太陽電池に光線が照射されなくなり、起電圧Eが発生しなくなった時、充電池16から太陽電池1の方に電流が流れるのを防止する。外部の明暗を検出する検出回路36により外部の明暗を検出する。この検出出力に応じて発光ダイオード8への電源をON、OFFするスイッチ回路18の切片をa側あるいはb側に切り替える。即ち、昼間で太陽電池1の起電圧が約9Vであれば、a側に切り替え、夜間の暗い時点で起電圧が0Vに近い場合にはb側に切り替える。37は点滅回路である。保護抵抗38は発光ダイオード(LED)8が短絡した場合、充電池16に過大電流が流れるのを防止すると共にLEDに適当な電流(この実施例では18~20mA)が流れるように選定される(この実施例では100オーム)。

【0062】ニッケル・カドミウム蓄電池16は充電、放電を繰り返すと、劣化するので、1~2年毎に交換する必要があるが、そのための部品取外孔19が必要であるが、部品交換用蓋20をあけて、中の蓄電池が盗まれる恐れがあるが、本発明では部品交換用蓋の丁度真上に支柱12が来るので、部品交換用蓋を簡単に開けることが出来ず、盗難防止に有効である。

【0063】(第3実施例)図9は本発明の発光ダイオードの接続用光漏洩防止装置の一部分解斜視図を示す。

【0064】スリーブ状の合成樹脂製ホルダ25はその貫通孔の内周面に無電解メッキ、光反射シートあるいはアルミ等の金属薄板等の光反射材26を備えており、この貫通孔内に複数個の光ファイバー束7'が接着剤にて接着固定される。そして、貫通孔に挿入固定された光ファイバー束7'の端縁の対向位置に光拡散のための所定の微小間隙(0.5~2mm)をもって発光ダイオードが接着剤にて固定される。

【0065】尚、ここで使用する反射シートは透明なガラスの微小球を透明な樹脂層に埋め込み、微小球の背面部側に或る一定の距離をおいて金属の蒸着層を設けた再帰性反射材である。

【0066】また、光ファイバー束7'の端縁と発光ダイオードとの間に微小間隙(0.5~2mm)を設ける時の光の拡散効果は図11に示す通りである。即ち、光ファイバー束7'の端縁と発光ダイオード8を直接当接させた時の光ファイバーの中心と周辺部の輝度は図11

(a)のように変化する。これに対して光ファイバー束7'の端縁と発光ダイオードとの間に微小間隙(0.5~2mm)を設けると、図11(b)に示すように輝度が変化し、中心部と周辺部との輝度の差は少なくなる。

【0067】図10は本発明の他の実施例である光漏洩防止装置の一部分解斜視図を示す。長方形状の合成樹脂製ホルダ25はその貫通孔の内周面に無電解メッキ、光反射シートあるいはアルミ等の金属薄板等の光反射材26を備えており、この貫通孔内に複数個の光ファイバー束7'が接着剤にて接着固定される。その際、光ファイバー束の先端から約5cmに渡ってエポキシ樹脂を塗布し、光ファイバー束を合成樹脂製ホルダ25に貫通させ、ホルダの面から約3cm突出させ、この状態でエポキシ樹脂を硬化させる。硬化後突出した光ファイバーを鋸で切り捨て、ヤスリとサンドペーパーで光ファイバー束の端縁を研磨し、最後にバフ(布製のグラインダー)かけし、光ファイバーの端縁を鏡面にする。発光ダイオードホルダ27の貫通孔の内周面には無電解メッキ、光反射シートあるいはアルミ等の金属薄板等の光反射材26が備えられており、発光ダイオード8はプリント基板28の銅箔にその電極が半田付けされている。この発光ダイオード8は発光ダイオードホルダ27の貫通孔内に挿入され、合成樹脂製の遮光兼光反射用パッキング29を介して前記ファイバーホルダ25に当接され、発光ダイオードホルダと共にボルト30とナット30'で締めつけ固定される。遮光兼光反射用パッキング29があるので、光ファイバーホルダ25と発光ダイオードホルダ27との端縁の面が密着しなくても光が光ファイバー以外の方向に漏洩することはない。

【0068】図12は本発明の他の実施例である光漏洩防止装置の一部分解斜視図を示す。図10と異なるのは長方形状の合成樹脂製ホルダ25に3個の貫通孔が設けられているということだけである。即ち、それら貫通孔の内周面には無電解メッキ、光反射シート、あるいはアルミ等の金属薄板等の光反射材26が備えられており、これら貫通孔内に複数個(3個)の光ファイバー束7'がそれぞれ接着剤にて接着固定される。

【0069】(第4実施例)図13は本発明の他の実施例である光漏洩防止装置の一部分解斜視図を示す。即ち、本実施例においては、発光ダイオードの側面に無電解メッキ31を施している。この場合には光ファイバーホルダ25と発光ダイオードホルダ27の貫通孔内に光反射材はなくてもよい。

【0070】(第5実施例)図14は本発明の他の実施例である自発光表示装置の一部分解斜視図を示す。即ち、本実施例においては、図2の筒状体(4-2)における第1、第2支持片(4-1)(4-1')の透孔5に光ファイバー7を配設する際、第1、第2支持片(4-1)(4-1')間の間隔を狭くするため、光ファイバー7mと7nを交差して配設するようにしている。即ち、第1

支持片 4-1 m の透孔 5 に挿通される光ファイバー 7 m は第 2 支持片 4-1 n の内面に沿って略並行に配設され、第 2 支持片 4-1 n の透孔 5 に挿通される光ファイバー 7 n は第 1 支持片 4-1 m の内面に沿って略並行に配設され、且つ両光ファイバーは交差して配設され、しかも両光ファイバーは所定の曲率をもって曲げられる。従って、第 1 支持片 4-1 m と第 2 支持片 4-1 n 間の間隔を狭くすることができる。

【0071】尚、本実施例は図 5 の第 1、第 2 支持片 (4-1) (4-1') に固定された第 1、第 2 パネル 1 5、1 5' にも適用できる。それ故、請求の範囲においては、図 2 における第 1、第 2 支持片 (4-1) (4-1') 及び図 5 における第 1、第 2 パネル 1 5、1 5' を総称して第 1、第 2 保持板と表現している。

【0072】図 1 5 は本発明の他の実施例である自発光表示装置の一部正面図を示す。即ち、本実施例においては、図 5 における第 1、第 2 支持片 (4-1) (4-1') に固定された第 1、第 2 パネル 1 5、1 5' の一部正面図を示し、パネル 1 5 の透孔 5 に光ファイバー 7 を挿通し、主剤と硬化剤とを混合調剤したエポキシ樹脂製接着剤 3 2 を塗布し、その後、ヘヤードライヤーを用いて、80 度 C ~ 90 度 C の熱風を約 1 分間、光ファイバーの透孔 5 挿通部及び光ファイバーの曲げ部分 3 3 に吹き付ける。

【0073】一般にアクリル製光ファイバーの場合、その直径を d 、光ファイバーの曲げ半径を r とすると、常温においては、 $100d < r$ の曲率をもって光ファイバーを曲げる必要がある。

【0074】しかしながら、本発明のように加熱処理することにより、光ファイバーの曲げ部分に発生する歪みストレスによる光ファイバー(アクリル)の光学的特性、即ち光伝導度や屈折率の劣化を防止すると共に機械的特性の劣化も抑制することができ、 $70d \leq r < 100d$ の曲率をもって光ファイバーを曲げることができる。また、接着用エポキシ樹脂の硬化時間を短縮できる。

【0075】図 1 6 は本発明の他の実施例である自発光表示装置の一部斜視図を示す。即ち、本実施例においては、図 1 5 と略同様であるが、光ファイバー 7 を予め、40 度 C ~ 50 度 C で約 1 分間加熱、保温して整形した後、光ファイバー 7 を透孔 5 に挿通する。

【0076】図 1 7 b は本発明の他の実施例である自発光表示装置の一部斜視図を示す。即ち、本実施例においては、図 5 におけるパネル 1 5 に光ファイバー 7 を挿通した状態を示す。即ち、パネル(あるいは保持板)の肉厚を D 、光ファイバーの直径を d とする時、従来は図 1 7 a に示すように所定の角度で光ファイバーを固定するためには通常 $D \geq 4d$ なるようにする必要がある。

【0077】本発明では図 1 7 b に示すように、パネル 1 5 c の外面 Q から補助板 3 4 の外面 S までの距離を D 、光ファイバーの直径を d とする時、 $D \geq 4d$ なるよ

うにすればよい。

【0078】(第 6 実施例) 図 1 9 は本発明の他の実施例である自発光表示装置の一部分解断面図を示す。即ち、図 1 9 (a) (b) 及び (c) は筒状体 (4-2)、光ファイバー 7 及び施蓋体 4-3 の組立て順を示す。本実施例においては、図 2 の筒状体 (4-2) と第 1、第 2 支持片 (4-1) (4-1') とを一体に成形し、且つ筒状体 (4-2) をそのまま延長して延長部 3 8、3 8' を設ける。延長部 3 8、3 8' は光ファイバー 7 の突出端より少許突出している。また、施蓋体 4-3 も筒状体 (4-2) の延長部 3 8、3 8' と同様に光ファイバー 7 の突出端より少許幅広くして突出させている。このような構成であるから、自発光表示装置が倒れた場合にも筒状体 (4-2) の延長部 3 8、3 8' や施蓋体 4-3 の幅広部に保護されるので、光ファイバー 7 の突出端が破損することはない。

【0079】(第 7 実施例) 図 2 0 は本発明の他の実施例である自発光表示装置の一部斜視図を示す。即ち、本実施例においては、図 1 の施蓋体 4-3 に装着された太陽電池架 2 をリード線 3 9 を延長して自発光表示装置とは別体の支柱 1 2 の上端に装着し、且つ筒状体 (4-2) の内部に取付金具 6 を設けた例である。

【0080】

【発明の効果】このように本発明は、数個の発光ダイオードとそれに先端が隣接するアクリル製光ファイバーに光漏洩防止手段を用いて表示装置を作製しており、従来から使用されている発光ダイオードの点光源点滅方式に比べ、光エネルギーが効率よく伝送でき、且つ光ファイバーによる発光点を表示板周縁に沿って、広く配置付設することができるため、視認効果が非常に高く、然も、電力消費量が非常に少なくなるという利点がある。

【0081】また、発光ダイオードの周囲に光反射材を配置したり、発光ダイオードに無電解メッキを施すような構成にしているので、光の損失がない。

【0082】また、光ファイバーを交差させて配置したり、光ファイバーに加熱処理を施すことにより光ファイバーの物理的特性、即ち、光伝導度、屈折率、機械的特性が損なわれないようにしながら、然も通常よりも遥かに急激な曲率、即ち、 $70d \leq r < 100d$ の曲率で光ファイバーを折り曲げられるので、相対向するパネル間の間隔を狭くでき、装置の小型化が量れる。また熱処理により接着用エポキシ樹脂の硬化時間を短縮できる。

【0083】また、光ファイバー取付用の保持板に所定の間隔で補助板を取り付けるので、材料を少なく且つ重量を軽く出来る。

【0084】更にまた、筒状体を延長した延長部及び施蓋体の少なくとも一方が支持片の透孔から突出した光ファイバーの一端縁よりも少許突出する程度に設定されているので、自発光表示装置が倒れても、光ファイバーの先端が破損する恐れはない。

【0085】更に他の実施例の自発光表示装置においては、自発光表示装置の包囲体の下部に排水孔が設けられているので、雨水等が溜らない。

【0086】また太陽電池はリード線を長くして置き、任意の位置、例えば、自発光表示装置とは別に予め設けられた近接の固定体に固定することにより、太陽光の最も効率的な受光をすることができる。

【図面の簡単な説明】

【図1】本発明の誘導標の自発光表示装置を示す斜視図である。

【図2】本発明の誘導標の自発光表示装置の内部構造を示す斜視図である。

【図3】本発明の自発光表示装置を装着する既存の消火栓標識を示す斜視図である。

【図4】本発明の他の自発光表示装置の斜視図を示す。

【図5】本発明の自発光表示装置の図4の(X-X)における断面斜視図である。

【図6】本発明の自発光表示装置の図4の(X-X)における断面図を示す。

【図7】本発明の図4における自発光表示装置の組立時の分解斜視図を示す。

【図8】本発明の自発光表示装置の取付け金具の分解斜視図を示す。

【図9】本発明の発光ダイオードの接続用光漏洩防止装置の一部分解斜視図を示す。

【図10】本発明の光漏洩防止装置の一部分解斜視図を示す。

【図11】本発明の光の拡散効果を示す特性図である。

【図12】本発明の他の実施例である光漏洩防止装置の一部分解斜視図を示す。

【図13】本発明の他の実施例である光漏洩防止装置の一部分解斜視図を示す。

【図14】本発明の他の実施例である自発光表示装置の部分正面図と斜視図を示す。

【図15】本発明の他の実施例である自発光表示装置の部分正面図を示す。

【図16】本発明の他の実施例である自発光表示装置の部分正面図を示す。

【図17】本発明の他の実施例である自発光表示装置の部分正面図及び断面図を示す。

【図18】本発明の実施例である自発光表示装置の電源回路を示す。

【図19】本発明の他の実施例である自発光表示装置の部分断面図を示す。

【図20】本発明の他の実施例である自発光表示装置の部分斜視図を示す。

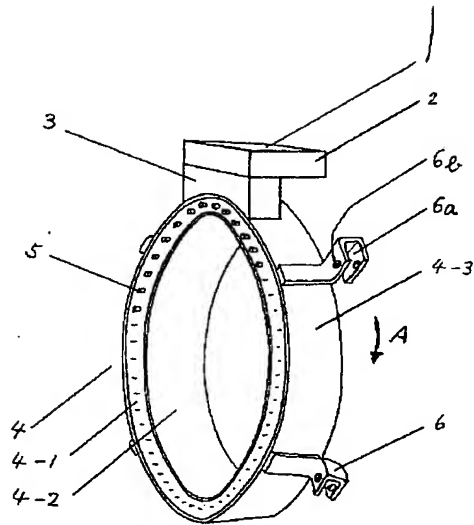
【図21】本発明の他の実施例である自発光表示装置の内部構造の部分斜視図を示す。

【符号の説明】

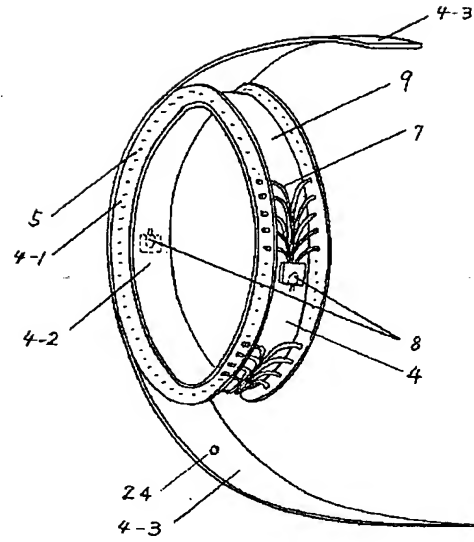
1 太陽電池モジュール

2 太陽電池架
3 支持具
4 包囲体
4-1, 4-1' 第1、第2支持片
4-1a, 4-1a' 第1、第2支持片の係合凹部
4-1m, 4-1n 第1、第2保持板
4-2 筒状体
(4-2)' (4-2)" 半筒状体
4-3 施蓋体
5 光ファイバー突出用の透孔
6 アーム取付金具
6a 凹陥部
6b 取付孔
7 光ファイバー
7' 光ファイバー束
8 発光ダイオード
9, 14 収納部
10 標識板
11-1, 2, 3 取付アーム
12 支柱
12a リング状支柱
13 ボルト、ナット
15, 15' 第1、第2パネル
16 充電用の蓄電池
17 光漏洩防止装置
18 スイッチ回路
19 部品取外孔
20 部品交換用蓋
21 取付け金具
22a, 22b ビス、ナット
23 基台
24 排水孔
25 合成樹脂製ホルダ
26 光反射材
27 発光ダイオードホルダ
28 プリント基板
29 遮光兼光反射用パッキング
30, 30' ボルト、ナット
31 無電解メッキ
32 接着剤
33 曲げ部分
34 補助板
35 逆流防止ダイオード
36 検出回路
37 点滅回路
38, 38' 延長部
39 リード線
40, 40' 接続板
41, 41', 42, 42' 取付孔
43, 43', 44, 44' ハトメ

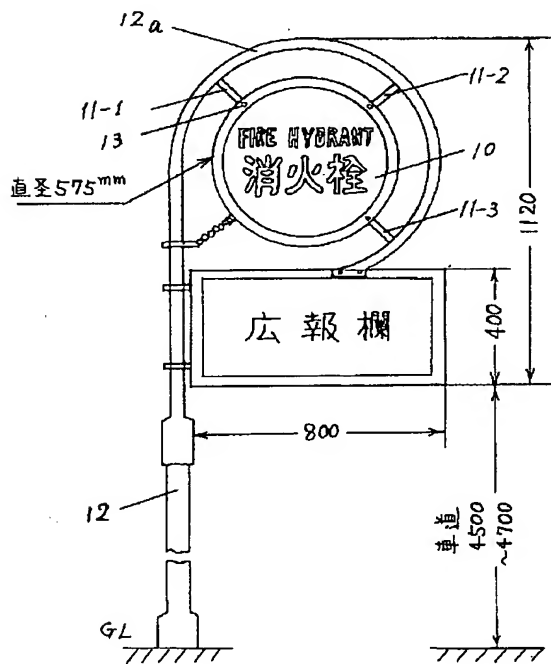
【図 1】



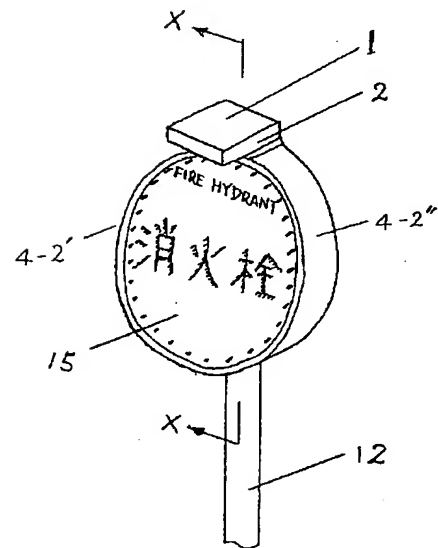
【図 2】



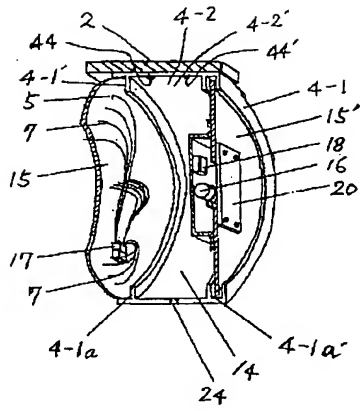
【図 3】



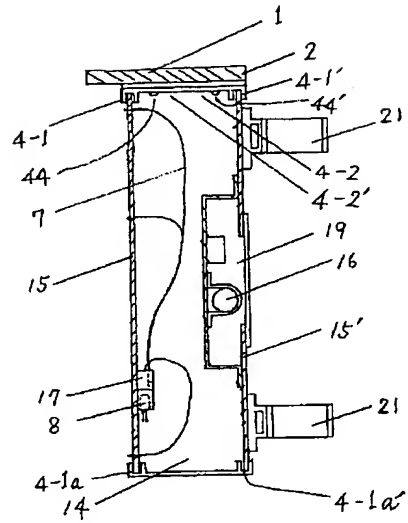
【図 4】



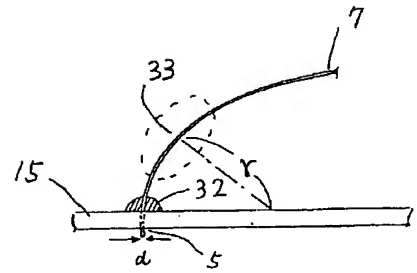
【図 5】



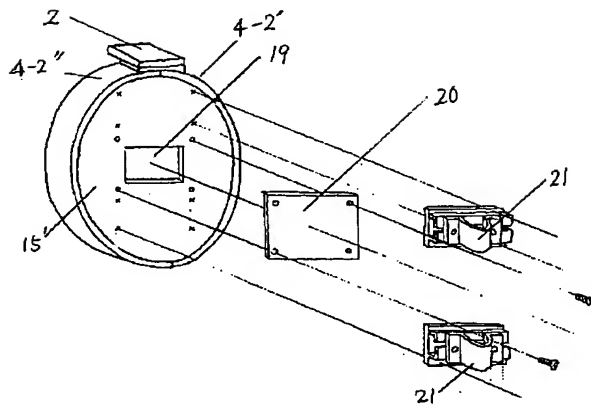
【図 6】



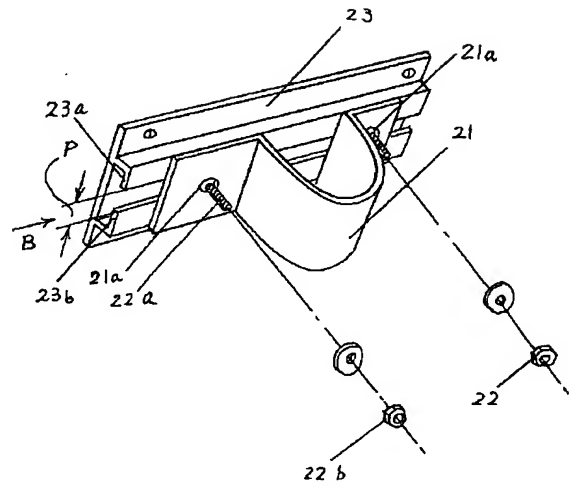
【図 15】



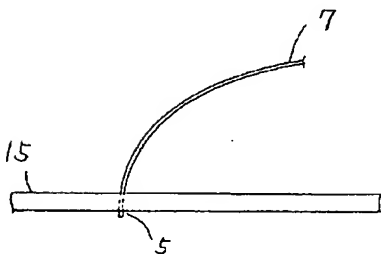
【図 7】



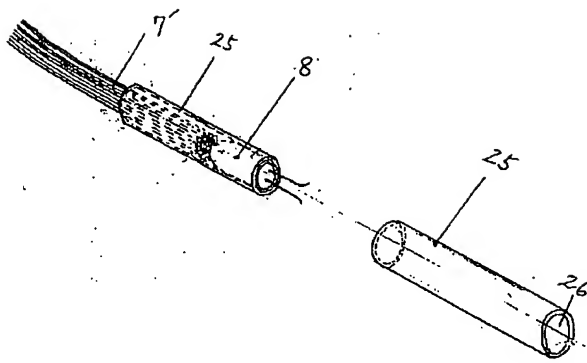
【図 8】



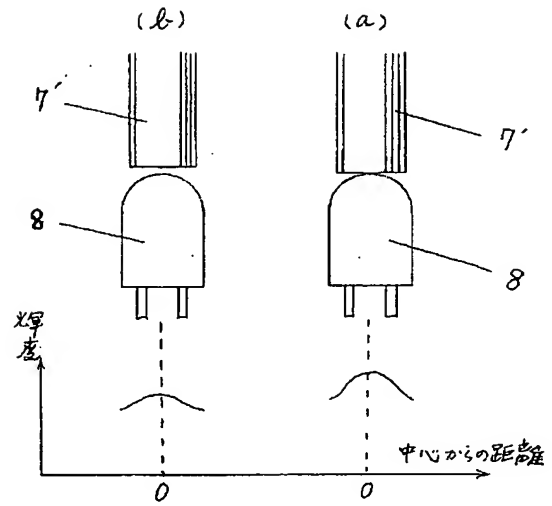
【図 16】



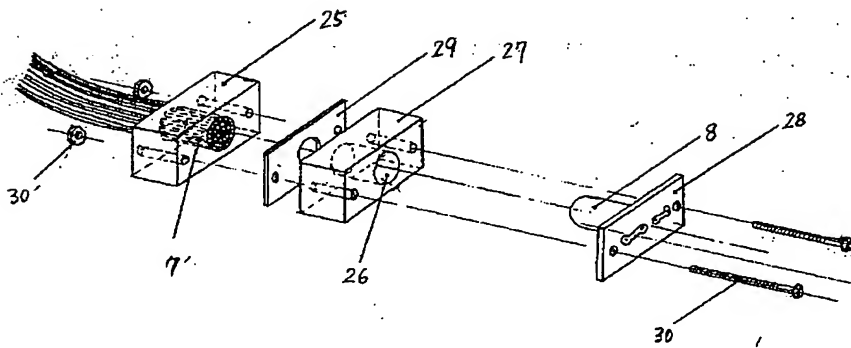
【図 9】



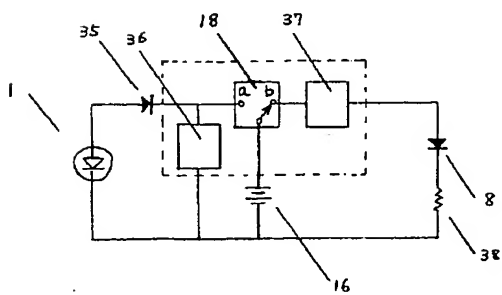
【図 11】



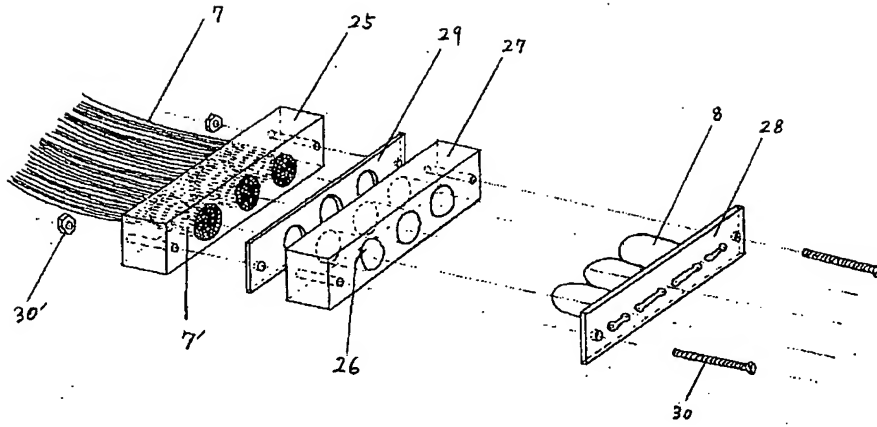
【図 10】



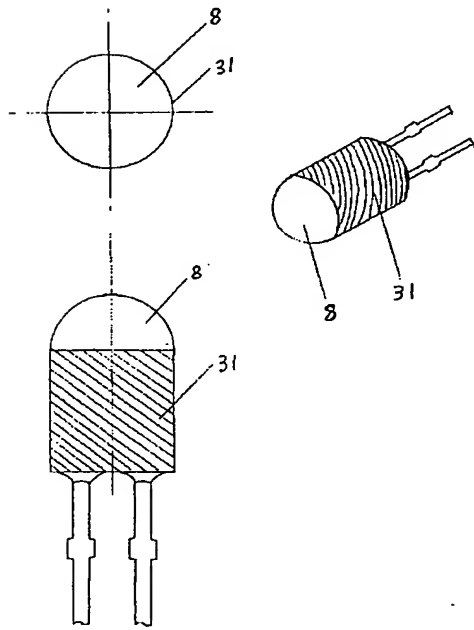
【図 18】



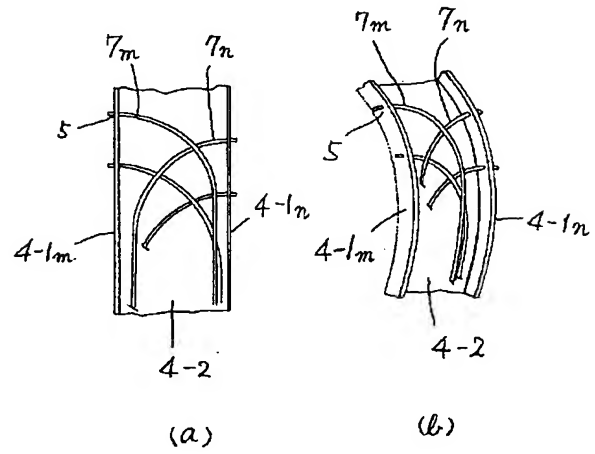
【図12】



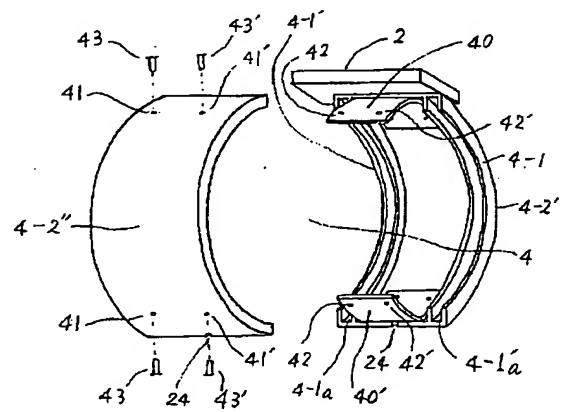
【図13】



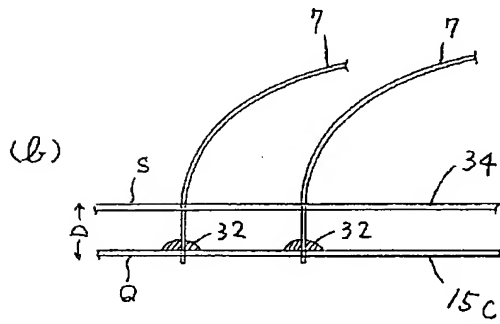
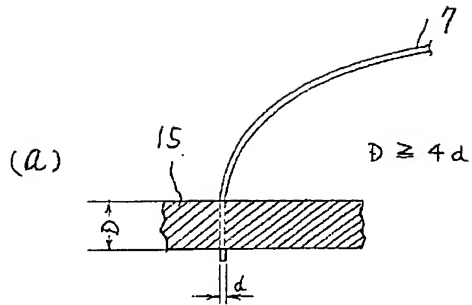
【図14】



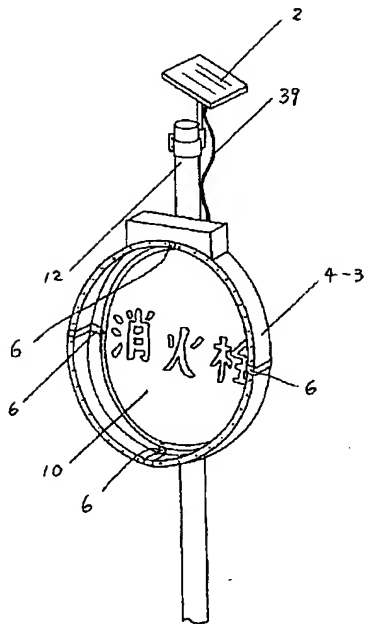
【図21】



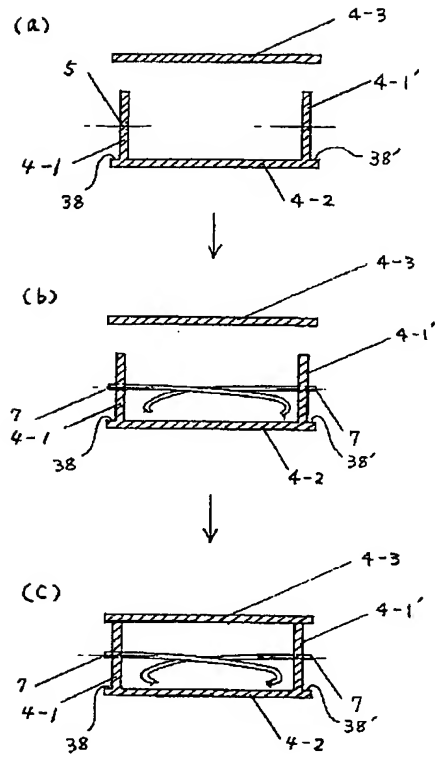
【図 17】



【図 20】



【図 19】



【手続補正書】

【提出日】平成6年11月17日

【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】請求項1

【補正方法】変更

【補正内容】

【請求項1】貫通孔の内周面に光反射材を備える合成樹脂製ホルダと、該貫通孔に固定される複数の光ファイバー束と、前記貫通孔に挿入固定された光ファイバー束の端縁の対向位置に光拡散のための所定の微小間隙をもって且つ該貫通孔内に挿入固定される発光ダイオードとを備える光ファイバーと発光ダイオードの接続用光漏洩防止装置。

【手続補正2】

【補正対象書類名】明細書

【補正対象項目名】0048

【補正方法】変更

【補正内容】

【0048】尚、光ファイバー7の後端縁を内側筒状体(4-2)の内壁面側から外壁面側に突出させて点滅させることも出来る。更に詳述すると、消火栓標識板10の外周に内側筒状体(4-2)を装着した状態において、消火栓標識板10のまわりで且つ消火栓標識板10の外周に略対向する内側筒状体(4-2)の内壁面側の位置から光ファイバー7の端縁を突出させて光を点滅させることも出来る。また、筒状体(4-2)と施蓋体4-3の配置を逆にして筒状体(4-2)を外側に、施蓋体4-3を内側に配置することもできる。更にまた、図20に示す如く、筒状体(4-2)の内径を大きくすることにより、アーム取付金具6は筒状体(4-2)の内側に取付けて置き、アーム取付金具6を既存の消火栓標識板10の外枠に直接取りつけることも出来る。

【手続補正3】

【補正対象書類名】明細書

【補正対象項目名】0051

【補正方法】変更

【補正内容】

【0051】本発明はこのように極く少数の発光ダイオードを用い、光ファイバーにより任意の立体位置に発光点を拡大配置することにより、標識板10の視認性を高めることができる。本発明者は夜間での視認性を確かめるため、光ファイバーの直径、配置間隔、発光ダイオードの消費電流を種々変化させ、夜間100(m)の距離から明るさを目視で比較する実験を行った。その結果、直径10(mm)の5000(mcd)の発光ダイオード2個を用い、上記の配置付設サイズで点滅させることにより、充分明るく視認性に富むことが確かめられた。上記の配置付設条件では、発光ダイオードの消費電力は約0.07(w)に低減でき、約0.4(W)の出力の太陽電

池で賄うことができるため、その経済的効果は大きい。

【手続補正4】

【補正対象書類名】明細書

【補正対象項目名】0058

【補正方法】変更

【補正内容】

【0058】また、図21に示すように、半筒状体(4-2)'と(4-2)"とを合体接続するため、半筒状体(4-2)'(4-2)"の内面と略同じ曲率を有する予め別に設けられたアルミ製の接続板40、40'を半筒状体(4-2)'(4-2)"の内方に当接し、半筒状体(4-2)'(4-2)"の取付孔41、41'及び接続板40、40'の取付孔42、42'にハトメ43、43'を挿入して固定する。また、太陽電池架2は太陽電池モジュール1を取り付ける前に、太陽電池架2、半筒状体(4-2)'(4-2)"、接続板40、40'を重ねた状態でそれぞれに設けられた取付孔(図示せず)にハトメ(図示せず)を挿入して固定する。

【手続補正5】

【補正対象書類名】明細書

【補正対象項目名】0059

【補正方法】変更

【補正内容】

【0059】また、図6及び図7にいても、同様に太陽電池架2に太陽電池モジュール1を取り付ける前に、太陽電池架2、半筒状体(4-2)'(4-2)"を重ねた状態でそれぞれに設けられた取付孔(図示せず)にハトメ44、44'を挿入して固定する。

【手続補正6】

【補正対象書類名】明細書

【補正対象項目名】請求項14

【補正方法】変更

【補正内容】

【請求項14】(a)内方側の両端に相対向して配設される防水兼用第1第2支持片が設けられた一対の半筒状体を相対向組合わせて形成される包囲体と、(b)該包囲体の前記第1支持片に固定されると共に複数の透孔が設けられ且つ標識表示部が設けられた第1パネルと、(c)前記包囲体の前記第2支持片に固定される第2パネルと、(d)前記包囲体と前記第1第2パネルとより形成される収納部と、(e)該収納部に収納され且つその一端が前記第1あるいは第2パネルの少なくとも一方に設けられた複数の透孔にそれぞれ挿入固定される複数の光ファイバーと、(f)該収納部に収納され且つ前記複数の光ファイバーの他端を互いに集束して切断した集束他端縁に隣接して配設され且つ光漏洩防止手段を備える発光ダイオードと、(g)該発光ダイオードの供給用電源と、(h)前記包囲体或いは第2パネルに装着され且つ該包囲体或いは第2パネルに固定される

取付け金具とを備える自発光表示装置。

【手続補正7】

【補正対象書類名】明細書

【補正対象項目名】請求項29

【補正方法】変更

【補正内容】

【請求項29】 (a) 複数の透孔が設けられた保持板

【手続補正書】

【提出日】平成7年2月8日

【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】特許請求の範囲

【補正方法】変更

【補正内容】

【特許請求の範囲】

【請求項38】 (a) 内部に収納部が設けられ且つ複数の透孔の設けられた包囲体と、 (b) 前記収納部に収納され且つその一端がそれぞれ複数の透孔に挿入固定される複数の光ファイバーと、 (c) 前記ファイバーの他端に隣接して配設され且つ光漏洩防止手段を備える発光ダイオードと、 (d) 該発光ダイオードの供給用電源と、 (e) 前記包囲体に装着され且つ包囲体を固定する取付け金具とを備える消火栓等の標識明示用の自発光表示装置。

【手続補正書】

【提出日】平成7年4月6日

【手続補正1】

【補正対象書類名】明細書

【補正対象項目名】特許請求の範囲

【補正方法】変更

【補正内容】

【特許請求の範囲】

【請求項1】 貫通孔の内周面に光反射材を備える合成樹脂製ホルダと、該貫通孔に固定される複数の光ファイバー束と、前記貫通孔に挿入固定された光ファイバー束の端縁の対向位置に光拡散のための所定の微小間隙をもって且つ該貫通孔内に挿入固定される発光ダイオードとを備える光ファイバーと発光ダイオードの接続用光漏洩防止装置。

【請求項2】 光反射材は無電解メッキである請求項1に記載の光漏洩防止装置。

【請求項3】 光反射材は貫通孔の内周面に挿入される反射シートである請求項1に記載の光漏洩防止装置。

【請求項4】 光反射材は貫通孔の内周面に挿入されるアルミ等の金属薄板である請求項1に記載の光漏洩防止装置。

と、 (b) 予め所定時間の加熱保温により一端から所定の位置で所定の曲率をもって曲げられ且つ該一端が前記保持板の透孔に貫挿される光ファイバーと、 (c) 前記光ファイバーの他端に隣接して配設される発光ダイオードと、 (d) 該発光ダイオードの供給用電源と、を備える自発光表示装置。

【請求項39】 前記発光ダイオードの光漏洩防止手段は該ダイオードの被覆側面に施された無電解メッキである請求項38に記載の自発光表示装置。

【請求項40】 前記光ファイバーと該光ファイバーの集束他端縁に隣接して配設される発光ダイオードの光漏洩防止手段は請求項1、2、3、4、5、6、7、8、9、10、11、12或るいは13に記載の光漏洩防止装置である請求項38に記載の自発光表示装置。

【請求項41】 前記供給用電源は前記包囲体或は予め別に設けられた近接固定体の内のいずれか一つに装着される太陽電池架に配設された太陽電池である請求項38に記載の自発光表示装置。

【請求項42】 前記取付け金具にて包囲体を既設の消火栓標識板或るいは消火栓標識板取り付けアームに取り付けることを特徴とする請求項38、39、40、或るいは41に記載の自発光表示装置。

【請求項5】 少なくとも1個の貫通孔が設けられた合成樹脂製ファイバーホルダと、該貫通孔に挿入固定される複数の光ファイバー束と、前記貫通孔に挿入固定された光ファイバー束の端縁の対向位置に少なくとも1個の貫通孔が設けられ且つ該貫通孔の内周面に光反射材を備える合成樹脂製発光ダイオードホルダと、該発光ダイオードホルダの貫通孔に挿入固定される発光ダイオードと、前記ファイバーホルダと発光ダイオードホルダとを締めつけ固定する固定手段とを備える光ファイバーと発光ダイオードの接続用光漏洩防止装置。

【請求項6】 ファイバーホルダの貫通孔の内周面に光反射材を備える請求項5に記載の光漏洩防止装置。

【請求項7】 光反射材は無電解メッキである請求項5或るいは6に記載の光漏洩防止装置。

【請求項8】 光反射材は反射シートである請求項5或るいは6に記載の光漏洩防止装置。

【請求項9】 光反射材はアルミ等の金属薄板である請求項5或るいは6に記載の光漏洩防止装置。

【請求項10】 ファイバーホルダと発光ダイオードホルダとの間に遮光兼光反射用パッキングを介在させた請求項5、6、7、8或るいは9に記載の光漏洩防止装置。

置。

【請求項 11】 発光ダイオードはプリント基板上の銅箔に半田付け固定されている請求項 5、6、7、8、9 或るいは 10 に記載の光漏洩防止装置。

【請求項 12】 発光ダイオードの前端面と光ファイバーの端縁の対向面間に光拡散のための所定の微小間隙を設けてなる請求項 5、6、7、8、9、10 或るいは 11 に記載の光漏洩防止装置。

【請求項 13】 固定手段はボルトとナットよりなる請求項 5、6、7、8、9、10、11 或るいは 12 に記載の光漏洩防止装置。

【請求項 14】 (a) 内方側の両端に相対向して配設される防水兼用第 1 第 2 支持片が設けられた一对の半筒状体を相対向組合わせて形成される包囲体と、(b) 該包囲体の前記第 1 支持片に固定されると共に複数の透孔が設けられ且つ標識表示部が設けられた第 1 パネルと、(c) 前記包囲体の前記第 2 支持片に固定される第 2 パネルと、(d) 前記包囲体と前記第 1 第 2 パネルとより形成される収納部と、(e) 該収納部に収納され且つその一端が前記第 1 あるいは第 2 パネルの少なくとも一方に設けられた複数の透孔にそれぞれ挿入固定される複数の光ファイバーと、(f) 該収納部に収納され且つ前記複数の光ファイバーの他端を互いに集束して切断した集束他端縁に隣接して配設され且つ光漏洩防止手段を備える発光ダイオードと、(g) 該発光ダイオードの供給用電源と、(h) 前記包囲体或るいは第 2 パネルに装着され且つ該包囲体或るいは第 2 パネルに固定される取付け金具とを備える自発光表示装置。

【請求項 15】 (a) 筒状体の両端に配設され且つ複数の透孔の設けられた相対向する第 1 第 2 支持片を具備する包囲体と、(b) 前記筒状体と前記第 1 第 2 支持片より形成される凹陷収納部と、(c) 該凹陷収納部に収納され且つその一端がそれぞれ前記第 1 あるいは第 2 支持片の少なくとも一方の複数の透孔に挿入固定される複数の光ファイバーと、(d) 前記凹陷収納部に収納され且つ前記ファイバーの他端に隣接して配設され且つ光漏洩防止手段を備える発光ダイオードと、(e) 該発光ダイオードの供給用電源と、(f) 前記凹陷収納部を施蓋する施蓋体と、(g) 前記施蓋体あるいは包囲体に装着され且つ該施蓋体或るいは包囲体を固定する取付け金具とを備える消火栓等の標識明示用の自発光表示装置。

【請求項 16】 前記筒状体を延長した延長部及び前記施蓋体の少なくとも一方が前記支持片の透孔から突出した光ファイバーの一端縁よりも少許突出する程度に設定された請求項 15 に記載の自発光表示装置。

【請求項 17】 前記発光ダイオードの光漏洩防止手段は該ダイオードの被覆側面に施された無電解メッキである請求項 14、15 或るいは 16 に記載の自発光表示装置。

【請求項 18】 前記光ファイバーと該光ファイバーの

集束他端縁に隣接して配設される発光ダイオードの光漏洩防止手段は請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置である請求項 14、15 或るいは 16 に記載の自発光表示装置。

【請求項 19】 前記供給用電源は前記包囲体或るいは前記第 2 パネルに設けられた太陽電池架上に装着される太陽電池である請求項 14 に記載の自発光表示装置。

【請求項 20】 前記供給用電源は前記施蓋体、前記包囲体、及び予め別に設けられた近接固定体の内のいずれか一つに装着される太陽電池架に配設された太陽電池である請求項 15 に記載の自発光表示装置。

【請求項 21】 前記収納部に収納された蓄電池を交換するための取外孔が前記第 2 パネルに設けられ且つ前記取付け金具が該取外孔に対向する位置に設けられた請求項 14、17、18 或るいは 19 に記載の自発光表示装置。

【請求項 22】 前記収納部内に蓄電池、点滅回路が内蔵される請求項 14、17、18、19 或るいは 21 に記載の自発光表示装置。

【請求項 23】 前記太陽電池架内に蓄電池、点滅回路が内蔵される請求項 15、16、17、18 或るいは 20 に記載の自発光表示装置。

【請求項 24】 前記取付け金具にて前記施蓋体或るいは包囲体を既設の消火栓標識板取り付けアームに取り付け自在にしたことを特徴とする請求項 15、16、17、18、20 或るいは 23 に記載の自発光表示装置。

【請求項 25】 (a) 複数の透孔が設けられ且つ相対向して所定の間隔で配設される第 1 保持板及び第 2 保持板と、(b) 前記第 1 保持板の内面近傍に沿って略並行に配設され、且つ所定の曲率をもって曲げられ一端が前記第 2 保持板のそれぞれの透孔に貫挿される第 1 光ファイバーと、(c) 前記第 2 保持板の内面近傍に沿って略並行に配設されると共に前記第 1 光ファイバーと交差するように配設され、且つ所定の曲率をもって曲げられ一端が前記第 1 保持板のそれぞれの透孔に貫挿される第 2 光ファイバーと、(d) 前記第 1 第 2 光ファイバーの他端に隣接して配設される発光ダイオードと、(e) 該発光ダイオードの供給用電源とを備える自発光表示装置。

【請求項 26】 前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 25 に記載の自発光表示装置。

【請求項 27】 (a) 複数の透孔が設けられた保持板と、(b) 前記保持板の透孔に一端が貫挿される光ファイバーと、(c) 前記保持板に該光ファイバーを接着固定するために、該光ファイバーの貫挿される前記保持板の透孔の周囲及び該光ファイバーの周縁に塗布される接着剤

と、(d)前記光ファイバーの他端に隣接して配設される発光ダイオードと、(e)該発光ダイオードの供給用電源と、を備え、前記保持板に固定された前記光ファイバーの一端から所定の位置で前記光ファイバーを外圧力により所定の曲率をもって曲げ、前記光ファイバーの前記外部圧力による曲げ部分を所定時間加熱して、前記外部圧力による光ファイバーの曲げ部分の曲げ歪みによるストレスを低減させてなる自発光表示装置。

【請求項 28】前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 27 に記載の自発光表示装置。

【請求項 29】(a)複数個の透孔が設けられた保持板と、(b)予め所定時間の加熱保温により一端から所定の位置で所定の曲率をもって曲げられ且つ一端が前記保持板の透孔に貫挿される光ファイバーと、(c)前記光ファイバーの他端に隣接して配設される発光ダイオードと、(d)該発光ダイオードの供給用電源と、を備える自発光表示装置。

【請求項 30】前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 29 に記載の自発光表示装置。

【請求項 31】前記光ファイバーの直径を d 、光ファイバーの曲げ半径を r とすると、 $70d \leq r < 100d$ の曲率をもって光ファイバーを曲げることを特徴とする請求項 27、28、29、或るいは 30 に記載の自発光表示装置。

【請求項 32】前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 31 に記載の自発光表示装置。

【請求項 33】(a)所定の距離を隔てて或は直接添着して補助板を配設し且つ複数個の透孔が該補助板にも設けられた保持板と、(b)前記保持板の透孔に一端が貫挿される光ファイバーと、(c)前記光ファイバーの他端に隣接して配設される発光ダイオードと、(d)該発光ダイオードの供給用電源と、を備え、保持板の外表面から補助板

の外表面までの距離を D 、光ファイバーの直径を d とする時、 $D \geq 4d$ なるようにした自発光表示装置。

【請求項 34】前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 33 に記載の自発光表示装置。

【請求項 35】前記補助板は保持板と略同じ熱膨張係数を有することを特徴とする請求項 33 に記載の自発光表示装置。

【請求項 36】前記光ファイバーの他端と該他端に隣接して配設される発光ダイオードとの接続のための光漏洩防止手段として請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置を使用する請求項 35 に記載の自発光表示装置。

【請求項 37】前記包囲体の下部に排水孔を設けた請求項 14 或るいは 15 に記載の自発光表示装置。

【請求項 38】(a)内部に収納部が設けられ且つ複数個の透孔の設けられた包囲体と、(b)前記収納部に収納され且つその一端がそれぞれ複数個の透孔に挿入固定される複数個の光ファイバーと、(c)前記ファイバーの他端に隣接して配設され且つ光漏洩防止手段を備える発光ダイオードと、(d)該発光ダイオードの供給用電源と、(e)前記包囲体に装着され且つ包囲体を固定する取付け金具とを備える消火栓等の標識明示用の自発光表示装置。

【請求項 39】前記発光ダイオードの光漏洩防止手段は該ダイオードの被覆側面に施された無電解メッキである請求項 38 に記載の自発光表示装置。

【請求項 40】前記光ファイバーと該光ファイバーの集束他端縁に隣接して配設される発光ダイオードの光漏洩防止手段は請求項 1、2、3、4、5、6、7、8、9、10、11、12 或るいは 13 に記載の光漏洩防止装置である請求項 38 に記載の自発光表示装置。

【請求項 41】前記供給用電源は前記包囲体或は予め別に設けられた近接固定体の内のいずれか一つに装着される太陽電池架に配設された太陽電池である請求項 38 に記載の自発光表示装置。

【請求項 42】前記取付け金具にて包囲体を既設の消火栓標識板或るいは消火栓標識板取り付けアームに取り付けることを特徴とする請求項 38、39、40、或るいは 41 に記載の自発光表示装置。

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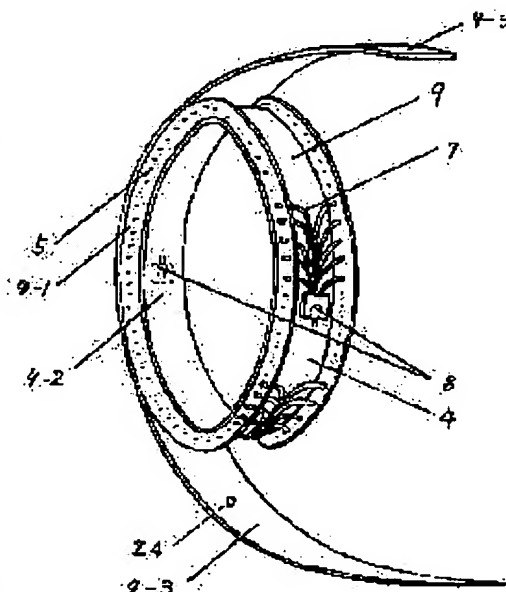
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(54) LIGHT LEAKAGE PREVENTIVE DEVICE AND SELF-LUMINOUS DISPLAY DEVICE FORMED BY USING THE SAME

(57)Abstract:

PURPOSE: To suppress loss of light, to miniaturize an apparatus and to make it possible to rapidly and visibly recognize the presence of a display, such as fire hydrant signals, etc., by using light leakage preventive means at the time of transmitting the light of light emitting diodes to many adjacent optical fibers.

CONSTITUTION: This device consists of an enclosure 4 which consists of a pair of semicylindrical bodies provided with first and second supporting pieces 4-1 disposed at both ends, a first panel which is fixed to the first supporting piece 4-1 of this enclosure 4, is provided with plural through-holes 5 over the circumferential edge and is provided with a signal display part, a second panel which is fixed to the second supporting piece of the enclosure 4, a housing section 9 which is formed of the enclosure 4 and the first and second panels, the optical fibers 7 which are housed in this housing section 9 and are respectively inserted and fixed at their one-side ends into the through-holes 5 provided in the first or the second panel and the light emitting diodes 8 which are housed in the housing section 9, disposed adjacently to the other end edges of the bundles formed by bundling the other-diode ends of plural pieces of the optical fibers 7 to each other and cutting these ends and have light leakage preventive means.



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CLAIMS

[Claim(s)]

[Claim 1] Optical leakage control equipment for connection of an optical fiber and a light emitting diode equipped with the light emitting diode by which insertion immobilization is carried out into this breakthrough with the predetermined minute gap for optical diffusion in the opposite location of the edge of the holder made of synthetic resin which equips the inner skin of a breakthrough with light reflex material, two or more optical-fiber bundles by which adhesion immobilization is carried out with adhesives at this breakthrough, and the optical-fiber bundle by which insertion immobilization was carried out at said breakthrough.

[Claim 2] Light reflex material is optical leakage control equipment according to claim 1 which is electroless deposition.

[Claim 3] Light reflex material is optical leakage control equipment according to claim 1 which is the reflective sheet inserted in the inner skin of a breakthrough.

[Claim 4] Light reflex material is optical leakage control equipment according to claim 1 which is metallic thin plates, such as aluminum inserted in the inner skin of a breakthrough.

[Claim 5] The fiber holder made of synthetic resin with which at least one breakthrough was prepared, The light emitting diode holder made of synthetic resin which at least one breakthrough is prepared in the opposite location of the edge of two or more optical-fiber bundles by which insertion immobilization is carried out, and the optical-fiber bundle by which insertion immobilization was carried out at said breakthrough at this breakthrough, and equips the inner skin of this breakthrough with light reflex material, Optical leakage control equipment for connection of an optical fiber and a light emitting diode equipped with a fixed means to bind tight the light emitting diode by which insertion immobilization is carried out, and said fiber holder and light emitting diode holder to the breakthrough of this light emitting diode holder, and to fix to it.

[Claim 6] Optical leakage control equipment according to claim 5 which equips the inner skin of the breakthrough of a fiber holder with light reflex material.

[Claim 7] claim 5 whose light reflex material is electroless deposition -- being certain -- it is -- optical leakage control equipment given in 6.

[Claim 8] claim 5 whose light reflex material is a reflective sheet -- being certain -- it is -- optical leakage control equipment given in 6.

[Claim 9] claim 5 whose light reflex material is metallic thin plates, such as aluminum, -- being certain -- it is -- optical leakage control equipment given in 6.

[Claim 10] claims 5, 6, 7, and 8 which made packing for protection from light-cum-light reflexes intervene between a fiber holder and a light emitting diode holder -- being certain -- it is -- optical leakage control equipment given in 9.

[Claim 11] claims 5, 6, 7, 8, and 9 by which soldering immobilization of the light emitting diode is carried out at the copper foil on a printed circuit board -- being certain -- it is -- optical leakage control equipment given in 10.

[Claim 12] claims 5, 6, 7, 8, 9, and 10 which come to prepare the predetermined minute gap for optical diffusion between the front end side of a light emitting diode, and the opposed face of the edge of an optical fiber -- being certain -- it is -- optical leakage control equipment given in 11.

[Claim 13] claims 5, 6, 7, 8, 9, 10, and 11 which a fixed means becomes from a bolt and a nut -- being certain -- it is -- optical leakage control equipment given in 12.

[Claim 14] (a) the [which is arranged in the ends by the side of the inner direction by carrying out phase opposite / water proof combination] -- the half-tube-like object of a couple with which the 1 2nd support

piece was prepared with the envelopment object by which phase opposite combination ***** is carried out (b) The 1st panel by which two or more bores were prepared over the periphery, and the indicator display was prepared while being fixed to said 1st support piece of this envelopment object, (c) -- the 2nd panel fixed to said 2nd support piece of said envelopment object, and (d) -- the [said / an envelopment object and / said] -- with the stowage formed from the 1 2nd panel (e) Two or more optical fibers by which insertion immobilization is carried out at two or more bores by which it was contained by this stowage and the end was prepared at least in one side of said 1st or 2nd panel, respectively, (f) Light emitting diode which is contained by this stowage, is adjoined and arranged in the focusing other end edge from which it converged mutually and the other end of two or more of said optical fibers was cut, and is equipped with an optical leakage control means, (g) It is the spontaneous light display with which the 2nd panel is equipped with the power source for supply of this light emitting diode, and the (h) aforementioned envelopment ***** , and this envelopment ***** is equipped with the fixing metal fixed to the 2nd panel.

[Claim 15] (a) the [in which it was arranged in the ends of a tube-like object, and two or more bores were prepared / which carries out phase opposite] -- with the envelopment object possessing the 1 2nd support piece (b) -- the [said / a tube-like object and / said] -- with the cavity stowage formed from the 1 2nd support piece (c) Two or more optical fibers with which it is contained by this cavity stowage, and insertion immobilization of the end is carried out at one [at least] bores of two or more of said 1st or 2nd support piece, respectively, (d) Light emitting diode which is contained by said cavity stowage, and adjoins the other end of said fiber, and is arranged, and is equipped with an optical leakage control means, (e) -- the power source for supply of this light emitting diode, and (f) -- the lidding object which lids said cavity stowage, and (g) -- the spontaneous light display for indicator designation of a fire hydrant equipped with the fixing metal with which said lidding object or an envelopment object is equipped, and this lidding ***** fixes an envelopment object etc.

[Claim 16] The spontaneous light display according to claim 15 set as extent which few-***** rather than the end edge of the optical fiber with which either [at least] the extension which extended said tube-like object, or said lidding object projected from the bore of said support piece.

[Claim 17] claims 14 and 15 which are the electroless deposition by which the optical leakage control means of said light emitting diode was given to the coat side face of this diode -- being certain -- it is -- a spontaneous light display given in 16.

[Claim 18] the optical leakage control means of the light emitting diode adjoined and arranged in the focusing other end edge of said optical fiber and this optical fiber -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- claims 14 and 15 which are optical leakage control equipment given in 13 -- being certain -- it is -- a spontaneous light display given in 16.

[Claim 19] For said envelopment ***** , said power source for supply is a spontaneous light display according to claim 14 which is the solar battery with which it is equipped on the solar-battery rack prepared in said 2nd panel.

[Claim 20] Said power source for supply is a spontaneous light display according to claim 15 which is the solar battery arranged in the solar-battery rack with which any one of said lidding object, said envelopment object, and the contiguity fixed objects established independently beforehand is equipped.

[Claim 21] claims 14, 17, and 18 prepared in the location where the removal hole for exchanging the battery contained by said stowage is prepared in said 2nd panel, and said fixing metal counters this removal hole -- being certain -- it is -- a spontaneous light display given in 19.

[Claim 22] claims 14, 17, 18, and 19 by which a battery and a flash circuit are built in in said stowage -- being certain -- it is -- a spontaneous light display given in 21.

[Claim 23] claims 15, 16, 17, and 18 by which a battery and a flash circuit are built in in said solar-battery rack -- being certain -- it is -- a spontaneous light display given in 20.

[Claim 24] claims 15, 16, 17, 18, and 20 characterized by said lidding ***** enabling installation of an envelopment object on an established fire hydrant indicator blanking attachment arm with said fixing metal - - being certain -- it is -- a spontaneous light display given in 23.

[Claim 25] (a) The 1st maintenance plate and the 2nd maintenance plate which two or more bores are prepared, and carry out phase opposite, and are arranged at the predetermined spacing, (b) The 1st optical fiber with which it is arranged [abbreviation], and is bent with predetermined curvature [near the inner surface of said 1st maintenance plate], and an end is ****(ed) by each bore of said 2nd maintenance plate, (c) It is arranged so that said 1st optical fiber may be intersected, while being arranged [abbreviation] [near the inner surface of said 2nd maintenance plate]. and the 2nd optical fiber with which it is bent with predetermined curvature and an end is ****(ed) by each bore of said 1st maintenance plate and (d) -- the

[said] -- a spontaneous light display equipped with the light emitting diode which adjoins the other end of the 1 2nd optical fiber, and is arranged, and the power source for supply of (e) this light emitting diode.

[Claim 26] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 25 which uses the optical leakage control equipment of a publication for 13.

[Claim 27] (a) the maintenance plate with which two or more bores were prepared, and (b) -- the optical fiber with which an end is ****(ed) by the bore of said maintenance plate, and (c), in order to carry out adhesion immobilization of this optical fiber at said maintenance plate The adhesives applied to the perimeter of the bore of said maintenance plate by which this optical fiber is ****(ed), and the periphery of this optical fiber, (d) Light emitting diode which adjoins the other end of said optical fiber and is arranged, (e) It has the power source for supply of this light emitting diode, and has predetermined curvature for said optical fiber with an external pressure by the position from the end of said optical fiber fixed to said maintenance plate. Bending, The spontaneous light display which predetermined time heating of the bending part by said external pressure of said optical fiber is carried out [display], and makes it come to decrease the stress by the bending distortion of the bending part of the optical fiber by said external pressure.

[Claim 28] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 27 which uses the optical leakage control equipment of a publication for 13.

[Claim 29] (a) the maintenance plate with which two or more bores were prepared, and (b) -- the optical fiber with which it is beforehand bent by heating incubation of predetermined time with curvature predetermined by the position from an end, and an end is ****(ed) by the bore of said maintenance plate, and (c) -- a spontaneous light display equipped with the light emitting diode which adjoins the other end of said optical fiber and is arranged, and the power source for supply of (d) this light emitting diode.

[Claim 30] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 29 which uses the optical leakage control equipment of a publication for 13.

[Claim 31] claims 27, 28, and 29 which will be characterized by bending an optical fiber with the curvature of $70d \leq r < 100d$ if the bend radii of d and an optical fiber are set to r for the diameter of said optical fiber -- being certain -- it is -- a spontaneous light display given in 30.

[Claim 32] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 31 which uses the optical leakage control equipment of a publication for 13.

[Claim 33] (a) The maintenance plate with which a predetermined distance was separated or it installed directly, and the accessory plate was arranged and two or more bores were prepared also in this accessory plate, (b) The optical fiber with which an end is ****(ed) by the bore of said maintenance plate, and light emitting diode which adjoins the other end of the (c) aforementioned optical fiber, and is arranged, (d) Spontaneous light display which was equipped with the power source for supply of this light emitting diode, and made $D \geq 4d$ of distance from the outside surface of a maintenance plate to the outside surface of an accessory plate like when setting the diameter of D and an optical fiber to d .

[Claim 34] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 33 which uses the optical leakage control equipment of a publication for 13.

[Claim 35] said accessory plate -- a maintenance plate and abbreviation -- the spontaneous light display according to claim 33 characterized by having the same coefficient of thermal expansion.

[Claim 36] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 35 which uses the optical leakage control equipment of a publication for 13.

[Claim 37] claim 14 which prepared the drain hole in the lower part of said envelopment object -- being certain -- it is -- a spontaneous light display given in 15.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the optical leakage control equipment for connection of an optical fiber and light emitting diode, and the spontaneous light display which uses it. Furthermore, if it explains in full detail, it is related with the optical leakage control equipment for connection. Use a light emitting diode for the source of luminescence, approach the light emitting diode, and the end of an optical fiber is arranged. It is what uses in case the light of a light emitting diode is transmitted through an optical fiber and light is transmitted to the point of the other end of an optical fiber emitting light, and offers the optical leakage control equipment for connection of a suitable optical fiber and a suitable light emitting diode. Offer the technique which can decrease loss of the light in the connection place of a light emitting diode and an optical fiber especially, and it is further related with a spontaneous light display. Light emitting diode is used for the source of luminescence, and it is related with the spontaneous light display which used the optical fiber for transmission of the light from light emitting diode to the point on a display emitting light. Moreover, this invention makes small the curvature which bends an optical fiber, and panel ***** holding an optical fiber narrows distance between maintenance plates, such as a support piece. It is what offers the technique which makes structure of a spontaneous light display thin. Further Moreover, in order to prevent that the head of the optical fiber inserted in the bore of maintenance plates, such as a support piece and a panel, damages this invention also when the spontaneous light indicating equipment for indicator designation of a fire hydrant etc. falls, The technique of making the part which adjoins an optical fiber few-***** (ing) rather than the head of an optical fiber is offered. Moreover, this invention offers the technique which prepares a drain hole in the lower part of the envelopment object of a spontaneous light display, and can drain storm sewage. Moreover, although this invention can also use a commercial alternating current power source as a power source for supply of light emitting diode, it offers a suitable spontaneous light display as a power source for supply of light emitting diode using a solar battery.

[0002] Generally, in order to influence the result of a fire-fighting activity [compaction of the initial action time amount] in fire fighting, it is very important to guide a fireman to a fire hydrant early correctly in the bad situation of a field of view. moreover, the case where the automobile has parked a car on the fire hydrant location even if a fire hydrant is found out at an early stage by the loan triggered by the difficulty of parking-space reservation with the spread of automobiles in recent years -- many -- a certain sake -- an operator -- caution -- evoking -- the side outside a fire hydrant -- being certain -- it is -- it is also important to guide so that a car may be made to park at the location of the outside of the route which leads to a fire hydrant.

[0003]

[Description of the Prior Art] It is difficult not to perform lighting to the indicator of a fire hydrant at all in many cases, and for a fireman to find a fire hydrant in the bad situation of a field of view conventionally, at night.

[0004] Moreover, although the display according [an incandescent lamp a fluorescent lamp, and neon *****] to much light emitting diodes (LED) is conventionally carried out to the lighting display of a traffic sign (display of a stop, DO NOT ENTER, the prohibition on left turn, No Right Turn, no parking, etc.), a common advertising display signboard, etc., these displays take much power. Therefore, although what is necessary is just to have supplied the power source of an incandescent lamp, a fluorescent lamp, a neon LGT, or LED from the power source when a commercial alternating current power source was in near, since there was no facility of a commercial alternating current power source in a detached building island, a developing country, etc., for installing a traffic sign, an ad pillar, etc. in a required place, the small

generation-of-electrical-energy facility needed to be formed, and a large amount of expense was required to install.

[0005] In order to solve such a problem, the technique of the indicator display which uses a light emitting diode as shown in JP,63-205689,A (G09F, 13/00), and an optical fiber is proposed conventionally. With such a conventional technique, in the connection place of a light emitting diode and an optical fiber, it reveals in addition to the edge of two or more optical-fiber bundles which the light of a light emitting diode counters with the diode, and loss of light arises. Although the end face of a light emitting diode was contacted only near the core of the edge side of an optical-fiber bundle and the brightness of the core of an optical-fiber bundle was high since the end face of a light emitting diode had curvature when the edge of two or more optical-fiber bundles was made to contact the end face of a light emitting diode directly in order to control loss of this light, brightness became low, therefore the periphery had the problem that brightness unevenness occurred on a graphic character or a graph.

[0006] moreover, highly humid [a snowstorm with strong traffic sign, advertising signboard, etc. which are installed in the outdoors a rainstorm, an elevated temperature, and highly humid] -- being certain -- it is -- although exposed to various situations, such as an arctic severe environment, no cures to it etc. are made conventionally. Moreover, since [which raises the visibility of a fire hydrant indicator conventionally again] nothing is conventionally taken into consideration about exchange and the cure against a theft of the components with which equipments, such as this, are equipped, Although the mounting beam spontaneous light type induction label etc. is used for the indicator plate in light emitting diode directly or indirectly in accordance with the fire hydrant indicator plate periphery, since one light emitting diode is directly used for one point emitting light, light emitting diode is needed [as for each of these] only for the number of the points emitting light. A mounting beam case, the power consumption of light emitting diode is set to about 0.6 (w), and, specifically, the solar battery of the output of about 3 (w) is needed [it is the pitch of about 118 (mm), and / in 16 light emitting diodes,] for the periphery of a diameter 646 (mm) for the time amount rate of burning in night, and putting out lights also as burning 1 and about two putting out lights. Even if it becomes the size of 220x200 (mm) extent, and it becomes large-scale also to remainder too much to the induction label of a diameter 650 [about] (mm) in the solar cell module by which current marketing is carried out and it thinks from the price (1(w) per 1500- 2000 yen) of a solar battery, it is lacking in profitability. Thus, if the activity number of light emitting diode increases, not only a solar battery but the power consumption of a battery becomes large, cost becomes high as a whole, and practicability is missing.

[0007] Moreover, if an optical fiber is bent more than a certain curvature when panel ***** holding an optical fiber carries out phase opposite, and arranges maintenance plates, such as a support piece, and it holds an optical fiber from the inner surface of both the maintenance plate to both the maintenance plate Since the transmission efficiency of a lifting and light fell distortion to the interior, spacing of both the maintenance plate could not be narrowed from the relation of the bending curvature of an optical fiber below at a predetermined distance, therefore the structure of a spontaneous light display was fairly large.

[0008] Furthermore, when the spontaneous light indicating equipment for indicator designation of a fire hydrant etc. fell, there was a problem that the head of the optical fiber inserted in the bore of maintenance plates, such as a support piece and a panel, was damaged again.

[0009] Moreover, the interior of the envelopment object of a spontaneous light display was covered with water, and there was also a problem of causing a failure.

[0010] Moreover, in the case of the indicator of the established fire hydrant with which it is not equipped with the source of luminescence for lighting, or a traffic sign, there are newly ***** , then a problem with a lighting system that a spontaneous light display must be installed, about lighting.

[0011]

[Problem(s) to be Solved by the Invention] This invention is offering the spontaneous light display for indicator designation of the fire hydrant whose lighting's is made in view of said problem, and uses the established indicator and established traffic sign of a fire hydrant as it is also in the case of the indicator of the conventional established fire hydrant with which it is not equipped with the source of luminescence for lighting, or a traffic sign, and is moreover possible with easy equipment.

[0012] Moreover, although leakage loss of light had arisen in the connection place of a light emitting diode and an optical fiber conventionally, it is decreasing leakage loss of the light in the connection place of this light emitting diode and optical fiber, and decreasing loss of power consumption.

[0013] Moreover, although there was a difficulty that the large solar battery and large battery of capacity are needed, cost becomes high as a whole with the increment in the consumed electric current by using much light emitting diodes, and as a result profitability and practicability are missing, in the conventional

spontaneous light display, this invention is offering a display with little power consumption.

[0014] Moreover, when panel ***** to which this invention holds an optical fiber carries out phase opposite, and arranges maintenance plates, such as a support piece, and it holds an optical fiber from the inner surface of both the maintenance plate to both the maintenance plate, even if it bends an optical fiber more than a certain curvature It is narrowing spacing of both the maintenance plate below at a predetermined distance, as distortion is not caused inside, therefore decline in the transmission efficiency of light is not made to cause, and making the structure of a spontaneous light display miniaturize.

[0015] furthermore -- again -- an outdoor display signboard and traffic **** -- being certain -- it is -- a snowstorm with a strong fire hydrant indicator etc., a rainstorm, and an elevated temperature -- highly humid -- being certain -- it is -- since it is put on various situations, such as a severe environment of chill, this invention is measuring the protection over it etc.

[0016] if batteries, such as nickel KADOMYUUMU, repeat 400 - 500 charge discharge, since the charge engine performance will deteriorate quickly -- about one year and a half -- it is exchanging batteries once a year [-2] and preventing the theft of components, such as a battery, with the ease of exchange of this battery.

[0017] Moreover, if an optical fiber is bent more than a certain curvature when panel ***** holding an optical fiber carries out phase opposite, and arranges maintenance plates, such as a support piece, and it holds an optical fiber from the inner surface of both the maintenance plate to both the maintenance plate Although there is a problem that spacing of both the maintenance plate cannot be narrowed from the relation of the bending curvature of an optical fiber below at a predetermined distance, therefore structure of a spontaneous light display cannot be miniaturized since the transmission efficiency of a lifting and light falls distortion to the interior This invention is offering the technique which can moreover enlarge the bending curvature of an optical fiber, without reducing the conduction effectiveness of light.

[0018] Furthermore, although there is a problem that the head of the optical fiber inserted in the bore of maintenance plates, such as a support piece and a panel, is damaged again when the spontaneous light indicating equipment for indicator designation of a fire hydrant etc. falls, it is offering the technique which can solve such a problem.

[0019] Moreover, it is offering the technique which can solve the problem of the interior of the envelopment object of a spontaneous light display being covered with water, and causing a failure.

[0020]

[Means for Solving the Problem] In the light emitting diode of this invention, and the optical leakage control equipment of an optical fiber The holder made of synthetic resin with which light reflex material, such as electroless deposition and a reflective sheet, is prepared in the inner skin of a breakthrough, It is constituted from the light emitting diode by which insertion immobilization is carried out by adhesives in this breakthrough with the predetermined minute gap for optical diffusion in the opposite location of two or more optical-fiber bundles by which adhesion immobilization is carried out, and the optical-fiber bundle by which insertion immobilization was carried out at this breakthrough in the breakthrough of that holder.

[0021] The fiber holder made of synthetic resin with which two or more breakthroughs were prepared with the optical leakage control equipment of other examples, The light emitting diode holder made of synthetic resin with which two or more optical-fiber bundles by which insertion immobilization is carried out, and two or more breakthroughs are prepared in the breakthrough of the holder, and light reflex material, such as electroless deposition and a reflective sheet, is prepared in the inner skin of the breakthrough, It consists of fixed means to bind tight the light emitting diode by which insertion immobilization is carried out, and said fiber holder and light emitting diode holder to the breakthrough of the light emitting diode holder, and to fix to it.

[0022] Furthermore, in other examples, packing for protection from light-cum-light reflexes which intervenes between an optical-fiber holder and a light emitting diode holder is further prepared in the above-mentioned optical leakage control equipment.

[0023] the [by which the spontaneous light display of this invention carries out phase opposite, and is arranged in the ends by the side of (a) inner direction / water proof combination] -- the half-tube-like object of a couple with which the 1 2nd support piece was prepared with the envelopment object by which opposite combination ***** is carried out (b) The 1st panel by which two or more bores were prepared over the periphery, and the indicator display was prepared while being fixed to the 1st support piece of this envelopment object, (c) -- the 2nd panel fixed to the 2nd support piece of said envelopment object, and (d) -- the [said / an envelopment object and / said] -- with the stowage formed from the 1 2nd panel (e) Two or more optical fibers by which insertion immobilization is carried out at two or more bores by which it was

contained by this stowage and that end was prepared at least in one side of said 1st or 2nd panel, respectively, (f) Light emitting diode which is contained by this stowage, is adjoined and arranged in the focusing other end edge from which it converged mutually and the other end of two or more of said optical fibers was cut, and is equipped with an optical leakage control means, (g) The 2nd panel is equipped with the power source for supply of this light emitting diode, and the (h) aforementioned envelopment ***** , and this envelopment ***** consists of fixing metal fixed to the 2nd panel.

[0024] The spontaneous light display for indicator designation of the fire hydrant which are other examples of this invention (a) -- the [in which it was arranged in the ends of a tube-like object, and two or more bores were prepared / which carries out phase opposite] -- with the envelopment object possessing the 1 2nd support piece (b) -- the [said / a tube-like object and / said] -- with the cavity stowage formed from the 1 2nd support piece (c) Two or more optical fibers with which it is contained by this cavity stowage, and insertion immobilization of the end is carried out at one [at least] bores of two or more of said 1st or 2nd support piece, respectively, (d) Light emitting diode which is contained by said cavity stowage, and adjoins the other end of said fiber, and is arranged, and is equipped with an optical leakage control means, (e) The power source for supply of this light emitting diode, the lidding object which lids the (f) aforementioned cavity stowage, and the (g) aforementioned lidding object or an envelopment object is equipped, and this lidding ***** consists of fixing metal which fixes an envelopment object.

[0025] consisting of optical leakage control equipment of the above-mentioned [the spontaneous light display of the example of further others of this invention / the optical leakage control means of said light emitting diode] ***** -- being certain -- it is -- it consists of electroless deposition performed to the coat side face of light emitting diode.

[0026] The spontaneous light display of other examples again of this invention consists of a solar battery with which it is equipped with said power source for supply on the solar-battery rack by which said envelopment ***** was prepared in said 2nd panel.

[0027] The spontaneous light display of the example of further others of this invention consists of a solar battery with which it is equipped with said power source for supply on the solar-battery rack by which said lidding ***** was prepared in the support piece.

[0028] In the spontaneous light display of other examples of this invention, the additional configuration of the removal hole prepared in the 2nd panel in order to exchange further the battery contained by said stowage, and said fixing metal formed in the location which counters this removal hole is carried out.

[0029] It has the battery and flash circuit where the spontaneous light display of the example of further others of this invention is built in in said stowage.

[0030] It has the battery and flash circuit where the spontaneous light display of the example of further others of this invention is built in in said solar-battery rack.

[0031] The spontaneous light display for indicator designation of the fire hydrant which is the example of further others of this invention is equipped with said fixing metal formed so that said lidding ***** could attach an envelopment object to an established fire hydrant indicator blanking attachment arm installation picking free.

[0032] The spontaneous light display of the example of further others of this invention (a) The 1st maintenance plate and the 2nd maintenance plate which two or more bores are prepared, and carry out phase opposite, and are arranged at the predetermined spacing, (b) The 1st optical fiber with which it is arranged [abbreviation], and is bent with predetermined curvature [near the inner surface of said 1st maintenance plate], and an end is ***** (ed) by each bore of said 2nd maintenance plate, (c) It is arranged so that said 1st optical fiber may be intersected, while being arranged [abbreviation] [near the inner surface of said 2nd maintenance plate]. and the 2nd optical fiber with which it is bent with predetermined curvature and an end is ***** (ed) by each bore of said 1st maintenance plate and (d) -- the [said] -- it consists of light emitting diode which adjoins the other end of the 1 2nd optical fiber, and is arranged, and a power source for supply of (e) this light emitting diode.

[0033] The spontaneous light display of the example of further others of this invention (a) ** in which two or more bores were prepared ****, the optical fiber with which an end is ***** (ed) by the bore of the (b) aforementioned maintenance plate, and in order to carry out adhesion immobilization of this optical fiber at the (c) aforementioned maintenance plate The adhesives applied to the perimeter of the bore by which this optical fiber of the inner surface of said maintenance plate is ***** (ed), and the periphery of this optical fiber, (d) Light emitting diode which adjoins the other end of said optical fiber and is arranged, (e) This luminescence DA It has the power source for supply of IODO, and has predetermined curvature for said optical fiber with an external pressure by the position from the end of said optical fiber fixed to said

maintenance plate. Bending, Predetermined time heating of the bending part by said external pressure of said optical fiber is carried out, and the stress by the bending distortion of the bending part by said external pressure is reduced.

[0034] The spontaneous light display of the example of further others of this invention (a) -- the maintenance plate with which two or more bores were prepared, and (b) -- with the optical fiber with which it is beforehand bent by heating incubation of predetermined time with curvature predetermined by the position from an end, and an end is ****(ed) by the bore of said maintenance plate (c) It consists of light emitting diode which adjoins the other end of said optical fiber and is arranged, and a power source for supply of (d) this light emitting diode.

[0035] The spontaneous light indicating equipment of the example of further others of this invention will bend an optical fiber with $70 d \leq r < 100d$ curvature, if the bend radii of d and an optical fiber are set to r for the diameter of said optical fiber.

[0036] The spontaneous light display of the example of further others of this invention (a) The maintenance plate with which a predetermined distance was separated or it installed directly, and the accessory plate was arranged and two or more bores were prepared also in this accessory plate, (b) The optical fiber with which an end is ****(ed) by the bore of said maintenance plate, and light emitting diode which adjoins the other end of the (c) aforementioned optical fiber, and is arranged, (d) It has the power source for supply of this light emitting diode, and when setting the diameter of D and an optical fiber to d , $D \geq 4d$ of distance from the outside surface of a maintenance plate to the outside surface of an accessory plate is made like.

[0037] the spontaneous light display of the example of further others of this invention -- said accessory plate -- a maintenance plate and abbreviation -- it has the same coefficient of thermal expansion.

[0038] The spontaneous light display of the example of further others of this invention is set as extent which few-***** rather than the end edge of the optical fiber with which either [at least] the extension which extended the tube-like object, or the lidding object projected from the bore of a support piece.

[0039] As for the spontaneous light display of the example of further others of this invention, the drain hole is prepared in the lower part of an envelopment object.

[0040]

[Function] In the connection place of the light emitting diode of this invention, and an optical fiber light reflex material, such as electroless deposition and a reflective sheet, prepares for the inner skin of the breakthrough of the holder made of synthetic resin -- having -- **** -- being certain -- it is, since it adheres to the light reflex material of electroless deposition on the side face of light emitting diode Luminescence from light emitting diode is altogether reflected by light reflex material in a breakthrough. being certain -- it is -- it is reflected in the direction of an optical fiber by the electroless deposition of the side face of a light emitting diode, and is transmitted in an optical fiber, and so, all are transmitted to the interior of an optical fiber, without revealing light outside in the connection place of a light emitting diode and an optical fiber.

[0041] In the spontaneous light display of this invention, with the combination of the optical fiber made from an acrylic by which contiguity arrangement is carried out at a small number of light emitting diode and it, since the arrangement attachment of the light spot of the light near **** wavelength can be greatly carried out widely along an indicator plate periphery, the flash actuation and interval can specify the location of a fire hydrant indicator vividly, and can raise inductive effect.

[0042] In the spontaneous light display of the example of further others of this invention Panel ***** holding an optical fiber carries out phase opposite, and arranges maintenance plates, such as a support piece. When holding an optical fiber from the inner surface of both the maintenance plate to both the maintenance plate, in the range in which the optical property of an optical fiber (acrylic), i.e., photoconductivity or a refractive index, does not deteriorate And in the range in which a mechanical property is not spoiled, the optical fiber held with a certain curvature in an optical fiber at bending and both the maintenance plate is made to cross, and spacing of both the maintenance plate is narrowed. Furthermore, in order to enlarge the bending curvature of an optical fiber, it heat-treats, and degradation of optical-fiber photoconductivity or a refractive index is prevented, and the mechanical property is made not to be spoiled.

[0043] In the spontaneous light display of the example of further others of this invention, since either [at least] the extension which extended the tube-like object, or the lidding object is set as extent which few-***** rather than the end edge of the optical fiber which projected from the bore of a support piece, even if a spontaneous light display falls, there is no possibility that the head of an optical fiber may be damaged.

[0044] In the spontaneous light display of the example of further others of this invention, since the drain hole is prepared in the lower part of the envelopment object of a spontaneous light display, storm sewage etc. does not collect.

[0045]

[Example] Hereafter, the example of this invention is explained based on a drawing.

[0046] (The 1st example) Drawing 1 is the perspective view showing the example of this invention. The solar-battery rack 2 which fixed the solar cell module 1 is attached in the upper part of 1st and 2nd support piece (4-1) (4-1)' of an outer diameter 674 (mm) through support 3. The bore 5 for the optical-fiber projection made from an acrylic is formed in 1st and 2nd support piece (4-1) (4-1)'. A total of 102 arrangement attachment of the optical fiber 7 of a diameter 0.75 (mm) is carried out into the bore 5, and where 2 (mm) projection is carried out from the outer wall of support piece (4-1) (4-1)', adhesion immobilization is carried out with the epoxy resin at about 40 (mm) spacing at support piece (4-1) (4-1)'. a battery and a flash circuit are built in the solar-battery rack 2 -- making -- the [moreover, / the inside tube-like object made of ABS plastics (4-2), and] -- two light emitting diodes (diameter 10 (mm)) 8, 8', 102 optical fibers 7, wiring, etc. are contained by the cavity stowage 9 formed from 1 2nd support piece (4-1) (4-1)'. The arm fixing metal 6 is being fixed to the periphery section of support piece (4-1) (4-1)', and it can attach in the mounting arm (11-1) (11-2) of the existing fire hydrant indicator plate 10 (11-3) with the arm fixing metal 6.

[0047] Drawing 2 is a perspective view for explaining the interior, and is the perspective view showing signs that it lids with the band-like lidding object 4-3 which wraps support piece (4-1) (4-1)'.

[0048] In addition, from the internal-surface side of an inside tube-like object (4-2), the back end edge of an optical fiber 7 can be made to be able to project to an external wall surface side, and can also be blinked. Moreover, arrangement of a tube-like object (4-2) and the lidding object 4-3 is made into reverse, a tube-like object (4-2) can also be arranged outside, and the lidding object 4-3 can also be arranged inside. Furthermore, as shown in drawing 20, by enlarging the bore of a tube-like object (4-2), the arm fixing metal 6 can be attached and placed inside a tube-like object (4-2), and the arm fixing metal 6 can also be attached to the outer frame of the existing fire hydrant indicator plate 10 direct picking again.

[0049] Drawing 3 shows the perspective view of the existing fire hydrant indicator plate currently generally used. That is, welding immobilization of the mounting arm (11-1) (11-2) (11-3) is carried out at ring-like stanchion 12a which extended the stanchion 12, and the iron indicator plate 10 with a thickness of about 1mm is being fixed to this mounting arm (11-1) (11-2) (11-3) with the bolt and the nut 13.

[0050] It is performed as follows for attaching the ring-like light-emitting part body for designation in the indicator plate 10. That is, as shown in drawing 1, the wearing immobilization of the fixing metal 6 can be carried out at a mounting arm (11-1) (11-2) (11-3) only by pushing a ring-like light-emitting part body against the mounting arm (11-1) (11-2) of the existing fire hydrant indicator plate 10 (11-3), and making it rotate to an one direction (the direction of arrow-head A) with the fixing metal 6 of a ring-like light-emitting part body. That is, fitting of the mounting arm (11-1) (11-2) (11-3) is carried out into cavity 6a of fixing metal 6, a bolt is inserted in mounting hole 6b, and fixing metal 6 is fixed to a mounting arm (11-1) (11-2) (11-3) by the nut bundle. So, the installation activity which attaches a light-emitting part body in the indicator plate 10 is also very easy. Of course, it can install in a construction site without a source power supply etc. regularly or temporarily especially in a general street for the ease of attachment and detachment.

[0051] This invention can raise the visibility of the indicator plate 10 using the light emitting diode of a **** fraction by carrying out amplification arrangement of the point emitting light with an optical fiber in the solid location of arbitration in this way. In order that this invention person might confirm visibility at night, he changed various consumed electric currents of the diameter of an optical fiber, arrangement spacing, and light emitting diode, and conducted the experiment which compares brightness visually from the distance of 100 (mm) at night. Consequently, it was confirmed by making it blink in the above-mentioned arrangement attachment size using two light emitting diodes of 5000 (mcd) of a diameter 10 (mm) that it is sufficiently brightly rich in visibility. Since the power consumption of light emitting diode can be reduced to about 0.07 (w) and the above-mentioned arrangement attachment conditions can be provided with the solar battery of the output of about 0.4 (W), the economical effectiveness is large.

[0052] Thus, since the induction label to which forming the solar battery of the size of 220x50 (mm) extent since it became a low power also fully operates is realized, it is connected in [a solar cell module battery, and flash circuit and ring-like light-emitting part body] one and it gets, an induction label can be miniaturized, and mounting becomes possible free with the direct and body fixing metal 6 as portable mold equipment at the established fire hydrant indicator plate 10. Moreover, since attenuation of the quantity of light can be disregarded for the combination of a light emitting diode and an optical fiber and the light near single wavelength blinks, an induction operation is remarkable and the induction label which is an easy configuration and was excellent with the interaction of the property of a light emitting diode and an optical

fiber and the property of a solar battery can be obtained.

[0053] Furthermore, the above-mentioned induction label can be used for various road signs, a number container reference plate, a billboard, various induction labels, and other extensive applications, and contributes to fire-fighting activities, a traffic paint, commercial publicity, etc. greatly.

[0054] (The 2nd example) Drawing 4 shows the perspective view of other spontaneous light displays of this invention, and a cross-section perspective view [in / in drawing 5 / (X-X) of drawing 4] and drawing 6 show the sectional view in (X-X) of drawing 4 . Drawing 7 shows the decomposition perspective view at the time of assembling a components removal hole, the lid for parts replacements, and fixing metal. Drawing 8 shows the decomposition perspective view at the time of attaching fixing metal in a pedestal. The same sign is attached and shown in drawing 1 , drawing 2 and drawing 3 , and a corresponding thing.

[0055] the ends of half-tube-like object (4-2)'(4-2)" of the product [***** / made from aluminum] made of synthetic resin, such as an acrylic, -- the -- while the 1 2nd support piece (4-1), '(4-1) and an engagement crevice (4-1a), and '(4-1a) are formed in one, it is equipped with the solar-battery rack 2 on the tube-like object. The bore 5 to display an alphabetic character and a notation on the 1st panel 15 for the disc-like fire hydrant indicator display of products made of synthetic resin, such as an acrylic, and for ***** made from aluminum carry out insertion immobilization of the optical fiber 7 made from an acrylic along with the alphabetic character and notation is formed. The bore 5 for ***** made from aluminum to carry out insertion immobilization of the optical fiber 7 made from an acrylic, in order to display an alphabetic character, a notation, etc. if needed although disc-like 2nd panel 15' of products made of synthetic resin, such as an acrylic, is equipped with the nickel KADOMYUMU battery 16 grade for charge is formed. Engagement immobilization of the one half of the 1st and 2nd panels is carried out at the engagement crevice (4-1a) established in the ends of one half-tube-like object (4-2)', and '(4-1a), respectively. Then, engagement immobilization of the remaining one half of the 1st and 2nd panels is carried out at the engagement crevice (4-1a) established in the ends of half-tube-like object (4-2)" of another side, and '(4-1a), respectively. A way side is equipped with the optical leakage control equipment 17 for connection of the below-mentioned light emitting diode 8 among the 1st panel 15. And in the half-tube-like object (4-2) stowage 14 formed by '(4-2) " , the 1st panel 15, and the 2nd panel 15', as shown in drawing 18 , the switching circuit 18 grade which responds to the flash circuit 37, the detector 33 which detects external light and darkness, and its detection output, and turns on and turns off the power source to a light emitting diode 8 is contained. In order to exchange the battery 16 for charge, the components removal hole 19 is formed in the location from which a battery can be removed at 2nd panel 15', and the components removal hole 19 is lidded with the lid 20 for parts replacements. As shown in drawing 7 and drawing 8 , the fixing metal 21 for attaching a body is being fixed to the stanchion 12 by bis-22a and nut 22b on 2nd panel 15', and the location is set up so that a stanchion 12 may come for the lid 20 for parts replacements exactly upwards. The pedestal 23 of fixing metal 21 is being fixed by welding made from aluminum on 2nd panel 15'. and it is shown in drawing 8 -- as -- the gap P between L type metallic-ornaments 23a of a pedestal 23, and 23b -- the head of bis-22a -- narrow -- and the diameter of the screw section -- few ** -- since it is large, where bis-22a is inserted in screwhole 21a of metallic ornaments 21, it inserts in Gap P from arrow-head B, and binds tight and fixes to L type metallic ornaments by nut 22b.

[0056] the 1st panel 15 top -- **** -- being certain -- it is -- since the end of an optical fiber is arranged along with the sign and it is made to project only about 2mm from a panel side, the check-by-looking include angle from the outside becomes large. Furthermore, what is necessary is just to make the head of an optical fiber the opening from a tip turn into an include angle which is about 60 degrees to extend a check-by-looking include angle, as the pencil was shaved.

[0057] a half-tube-like object (4-2) -- since the stowage 14 formed by '(4-2) the engagement crevice (4-1a), '(4-1a) and the 1st panel 15, and the 2nd panel 15' of "is sealed thoroughly, there is no possibility that storm sewage may permeate into a stowage. in addition -- putting the open air into the interior **** -- being certain -- it is -- **** -- unbearable -- it is necessary to make -- the small drain hole 24 of half-tube-like object (4-2)'(4-2)" may be caudad formed in a case.

[0058] Moreover, as shown in drawing 21 , in order to make coalesce connection of half-tube-like object (4-2)' and "(4-2), A way is contacted among " . the inner surface of half-tube-like object (4-2)'(4-2)", and abbreviation -- the connection plate 40 made from aluminum which has the same curvature and which was formed independently beforehand, and 40' -- half-tube-like object (4-2)' (4-2) -- half-tube-like object (4-2)' (4-2) -- an eyelet 43 and 43' are inserted in the mounting hole 41 of " , 41' and the connection plate 40, the mounting hole 42 of 40', and 42', and it fixes to them. Moreover, before the solar-battery rack 2 attaches a solar cell module 1, in the solar-battery rack 2, half-tube-like object (4-2) '(4-2)", and the connection plate

40 and the condition of having piled up 40', it inserts an eyelet 44 and 44' (not shown) in the mounting hole (not shown) established in each, and fixes to it.

[0059] even if it is in drawing 6 and drawing 7, before [moreover,] attaching a solar cell module 1 in the solar-battery rack 2 similarly -- the solar-battery rack 2 -- half--- an eyelet 44 and 44' (not shown) are inserted in the mounting hole (not shown) which was alike, respectively and was prepared where tube-like object (4-2)'(4-2)" is piled up, and it fixes to it.

[0060] By blinking a display at night, (a) visibility improves and the cutback effectiveness of (b) electrical energy is acquired. When according to the experiment of this invention person the light is made to switch on for 0.4 to 0.6 seconds and was made to put out for about 0.8 to 1.2 seconds, the above (a) and (b) were satisfied and it turned out that it is practical.

[0061] Drawing 18 shows an example of the power circuit used for this invention. The electromotive voltage E of a solar battery 1 is 4.8V, and has connected the solar battery to a two-piece serial in this example. Diode 35 is an object for antisuckbacks, and when a beam of light is no longer irradiated by the solar battery and an electromotive voltage E stops occurring, it prevents that a current flows from a battery charger 16 to the direction of a solar battery 1. The detector 36 which detects external light and darkness detects external light and darkness. the intercept of the switching circuit 18 which responds to this detection output, and turns on and turns off the power source to a light emitting diode 8 -- the a side -- being certain -- it is -- it changes to the b side. That is, if the electromotive voltage of a solar battery 1 is about 9V in day ranges, it changes to the a side, and when night is dark, and an electromotive voltage is close to 0V, it will change to the b side. 37 is a flash circuit. When light emitting diode (LED) 8 short-circuits, protective resistance 38 is selected so that the suitable current (this example 18-20mA) for LED may flow, while it prevents that an excessive current flows to a battery charger 16 (this example 100 ohms).

[0062] although there is a possibility that the lid 20 for parts replacements may be opened and an inner battery may be stolen although it is necessary to exchange every one - two years and the components removal hole 19 for it is required since the nickel KADOMYUUMU battery 16 will deteriorate, if charge and discharge are repeated -- this invention -- the lid for parts replacements -- since a stanchion 12 comes right above exactly, the lid for parts replacements cannot be opened easily, but it is effective in theft prevention.

[0063] (The 3rd example) drawing 9 -- some optical leakage control equipments for connection of the light emitting diode of this invention -- a decomposition perspective view is shown.

[0064] In the sleeve-like holder 25 made of synthetic resin, electroless deposition and light reflex sheet ***** equip the inner skin of that breakthrough with the light reflex material 26, such as metallic thin plates, such as aluminum, and adhesion immobilization of two or more optical-fiber bundle 7' is carried out with adhesives into this breakthrough. And light emitting diode is fixed to a breakthrough by the opposite location of the edge of optical-fiber bundle 7' by which insertion immobilization was carried out with adhesives with the predetermined minute gap (0.5-2mm) for optical diffusion.

[0065] In addition, the reflective sheet used here is the recurrence reflector which embedded the minute ball of transparent glass in the transparent resin layer, kept a certain fixed distance and prepared the metaled vacuum evaporation layer in the tooth-back section side of a minute ball.

[0066] Moreover, the spreading effect of the light when preparing a minute gap (0.5-2mm) between the edge of optical-fiber bundle 7' and light emitting diode is as being shown in drawing 11. That is, the core of the optical fiber at the time of making the edge and the light emitting diode 8 of optical-fiber bundle 7' contact directly and the brightness of a periphery change like drawing 11 (a). On the other hand, if a minute gap (0.5-2mm) is prepared between the edge of optical-fiber bundle 7', and light emitting diode, as shown in drawing 11 (b), brightness will change, and the difference of the brightness of a core and a periphery will decrease.

[0067] some optical leakage control equipments whose drawing 10 is other examples of this invention -- a decomposition perspective view is shown. In the rectangle-like holder 25 made of synthetic resin, electroless deposition and light reflex sheet ***** equip the inner skin of that breakthrough with the light reflex material 26, such as metallic thin plates, such as aluminum, and adhesion immobilization of two or more optical-fiber bundle 7' is carried out with adhesives into this breakthrough. In that case, apply an epoxy resin over about 5cm from the head of an optical-fiber bundle, make the holder 25 made of synthetic resin penetrate an optical-fiber bundle, and it is made to project about 3cm from the field of a holder, and is hardening **** about an epoxy resin in this condition. The optical fiber which projected after hardening is polished by the saw, and the edge of an optical-fiber bundle is polished with a cut-off, a file, and abrasive paper, and finally it buff(grinder made of cloth)-applies, and carries out, and the edge of an optical fiber is

made into a mirror plane. As for electroless deposition and light reflex sheet ***** , the inner skin of the breakthrough of the light emitting diode holder 27 is equipped with the light reflex material 26, such as metallic thin plates, such as aluminum, and light emitting diode 8 is. The electrode is soldered to the copper foil of a printed circuit board 28. It is inserted into the breakthrough of the light emitting diode holder 27, and is contacted by said fiber holder 25 through the packing 29 for protection from light-cum-light reflexes made of synthetic resin, and this light emitting diode 8 is at a bolt 30 and nut 30' in a light emitting diode holder. It is bound tight and fixed. Since the packing 29 for protection from light-cum-light reflexes occurs, even if the field of the edge of the optical-fiber holder 25 and the light emitting diode holder 27 does not stick, light is not revealed in the direction of [other than an optical fiber].

[0068] some optical leakage control equipments whose drawing 12 is other examples of this invention -- a decomposition perspective view is shown. It only differs from drawing 10 that three breakthroughs are prepared in the rectangle-like holder 25 made of synthetic resin. namely, -- the inner skin of these breakthroughs -- electroless deposition and a light reflex sheet -- being certain -- it is -- it has the light reflex material 26, such as metallic thin plates, such as aluminum, and adhesion immobilization of optical-fiber bundle 7' [two or more (three pieces)] is carried out with adhesives into these breakthroughs, respectively.

[0069] (The 4th example) some optical leakage control equipments whose drawing 13 is other examples of this invention -- a decomposition perspective view is shown. That is, in this example, electroless deposition 31 has been performed to the side face of light emitting diode. In this case, light reflex material may not be into the breakthrough of the optical-fiber holder 25 and the light emitting diode holder 27.

[0070] (The 5th example) some spontaneous light displays whose drawing 14 is other examples of this invention -- a decomposition perspective view is shown. That is, in case an optical fiber 7 is arranged in the bore 5 of the 1st and 2nd support piece (4-1) (4-1') in the tube-like object (4-2) of drawing 2 , in order to narrow spacing between the 1st and 2nd support pieces (4-1) (4-1'), he crosses and is trying to arrange optical fibers 7m and 7n in this example. Namely, 7m of optical fibers inserted in the bore 5 of the four to 1 m 1st support piece is arranged [abbreviation] in accordance with the inner surface of the four to 1 n 2nd support piece. 7n of optical fibers inserted in the bore 5 of the four to 1 n 2nd support piece is arranged [abbreviation] in accordance with the inner surface of the four to 1 m 1st support piece, and both optical fibers cross, and are arranged, and, moreover, both optical fibers are bent with predetermined curvature. Therefore, spacing between the four to 1 m 1st support piece and 2nd support piece 4-1n can be narrowed.

[0071] In addition, this example is applicable also to the 1st and 2nd panel 15 and 15' which were fixed to the 1st and 2nd support piece (4-1) (4-1') of drawing 5 . So, in a claim, the 1st and 2nd support piece (4-1) (4-1') in drawing 2 and the 1st and 2nd PA flannel 15 in drawing 5 , and 15' are named generically, and it is expressed as the 1st and 2nd maintenance plate.

[0072] some spontaneous light displays whose drawing 15 is other examples of this invention -- a front view is shown. A front view is shown. namely, a part of 1st and 2nd panel 15 fixed to the 1st and 2nd support piece (4-1) (4-1') in drawing 5 in this example, and 15' -- Insert an optical fiber 7 in the bore 5 of a panel 15, and the adhesives 32 made of an epoxy resin which carried out mixed dispensing of base resin and the curing agent are applied. Then, 80 degrees C - 90 degrees C hot blast is sprayed on the bore 5 insertion section of an optical fiber, and the bending part 33 of an optical fiber for about 1 minute using a hair dryer.

[0073] If the bend radii of d and an optical fiber are generally set to r for the diameter in the case of the optical fiber made from an acrylic, in ordinary temperature, it is necessary to bend an optical fiber with the curvature of $100 d < r$.

[0074] However, by heat-treating like this invention, while preventing degradation of the optical property of the optical fiber (acrylic) by the distortion stress generated into the bending part of an optical fiber, i.e., photoconductivity, and a refractive index, degradation of a mechanical property can also be controlled, and an optical fiber can be bent with the curvature which is $70 d \leq r < 100d$. Moreover, the setting time of the epoxy resin for adhesion can be shortened.

[0075] some spontaneous light displays whose drawing 16 is other examples of this invention -- a decomposition perspective view is shown. That is, in this example, although it is the same as that of drawing 15 and abbreviation, after heating for about 1 minute, keeping it warm at 40 degrees C - 50 degrees C beforehand and operating an optical fiber 7 orthopedically, an optical fiber 7 is inserted in a bore 5.

[0076] some spontaneous light displays whose drawing 17 b is other examples of this invention -- a decomposition perspective view is shown. That is, in this example, the condition of having inserted the optical fiber 7 in the panel 15 in drawing 5 is shown. that is, conventionally, when setting the diameter of D and an optical fiber to d for the thickness of a panel (being certain -- it is -- a maintenance plate), as shown in drawing 17 a, in order to fix an optical fiber at an angle of predetermined, it is usually necessary to make

D>=4d like

[0077] What is necessary is just to make D>=4d of distance from the outside surface Q of panel 15c to the outside surface S of an accessory plate 34 like in this invention, when setting the diameter of D and an optical fiber to d as shown in drawing 17 b.

[0078] (The 6th example) some spontaneous light displays whose drawing 19 is other examples of this invention -- a decomposition sectional view is shown. That is, drawing 19 (a), (b), and (c) show the order of an assembly of a tube-like object (4-2), an optical fiber 7, and the lidding object 4-3. In this example, the tube-like object (4-2) and the 1st and 2nd support piece (4-1) of drawing 2 (4-1') are fabricated to one, and a tube-like object (4-2) is extended as it is, and an extension 38 and 38' are prepared. An extension 38 and 38' are few-***** (ed) from the projection edge of an optical fiber 7. moreover, the lidding object 4-3 -- the extension 38 of a tube-like object (4-2), and 38' -- the same -- the projection edge of an optical fiber 7 -- few ** -- it is made broad and made to project Since it is such a configuration and is protected by the extension 38 of a tube-like object (4-2), and width-of-face Hirobe of 38' or the lidding object 4-3 also when a spontaneous light display falls, the projection edge of an optical fiber 7 is not damaged.

[0079] (The 7th example) some spontaneous light displays whose drawing 20 is other examples of this invention -- a perspective view is shown. That is, in this example, it is the example which lead wire 39 was extended, and the spontaneous light display equipped the upper bed of the stanchion 12 of another object with the solar-battery rack 2 with which the lidding object 4-3 of drawing 1 was equipped, and formed fixing metal 6 in the interior of a tube-like object (4-2).

[0080]

[Effect of the Invention] thus , since this invention use an optical leakage control means for the optical fiber made from an acrylic with which a head adjoin some light emitting diodes and it , and be produce the display , and light energy can transmit efficiently compared with the point light source flash method of the light emitting diode currently use from the former and the arrangement attachment of the point by the optical fiber emit light can be widely carry out along a plotting board periphery , there be an advantage that the check by looking effectiveness be dramatically high , and power consumption of ** decrease dramatically .

[0081] Moreover, since light reflex material is arranged around light emitting diode or it is made a configuration which performs electroless deposition to light emitting diode, there is no loss of light.

[0082] Moreover, since ** can also bend an optical fiber with curvature far more rapid than usual, i.e., $70 d \leq r < 100d$ curvature, while the physical characteristic of an optical fiber, i.e., photoconductivity, a refractive index, and a mechanical property are made not to be spoiled by making an optical fiber cross, and arranging it or heat-treating to an optical fiber, the gap between the panels which carry out phase opposite can be narrowed, and the miniaturization of equipment can be measured. Moreover, the setting time of the epoxy resin for adhesion can be shortened by heat treatment.

[0083] Moreover, since an accessory plate is attached in the maintenance plate for optical-fiber mounting at the predetermined spacing, weight can be made light few in an ingredient.

[0084] Furthermore, since either [at least] the extension which extended the tube-like object, or the lidding object is set as extent which few-***** rather than the end edge of the optical fiber which projected from the bore of a support piece again, even if a spontaneous light indicating equipment falls, there is no possibility that the head of an optical fiber may be damaged.

[0085] Furthermore, in the spontaneous light display of other examples, since the drain hole is prepared in the lower part of the envelopment object of a spontaneous light display, storm sewage etc. does not collect.

[0086] Moreover, a solar battery can carry out most efficient light-receiving of sunlight by lengthening lead wire, placing it and fixing to the near fixed object beforehand established apart from the location of arbitration, for example, a spontaneous light display.

[Translation done.]

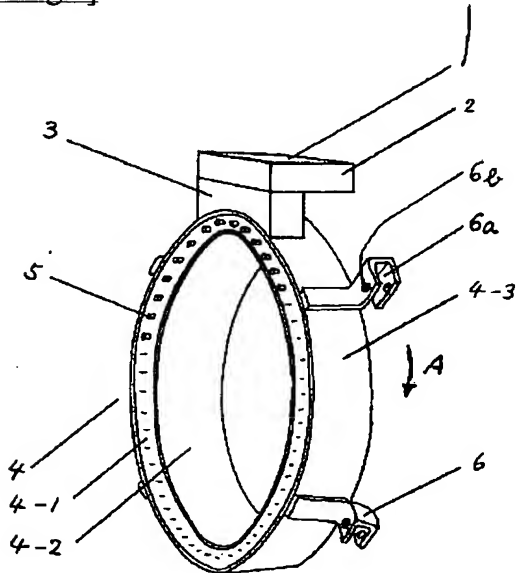
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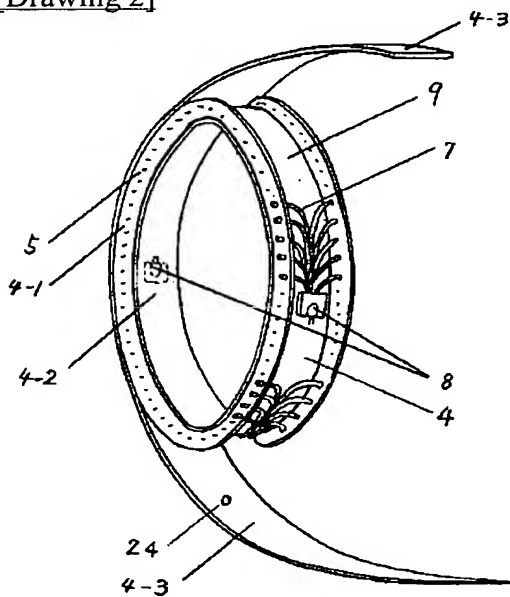
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3. In the drawings, any words are not translated.

DRAWINGS

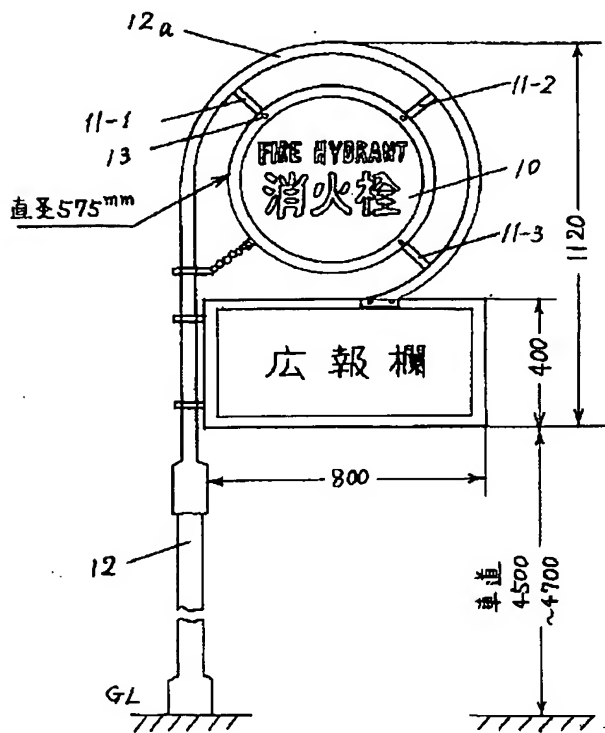
[Drawing 1]



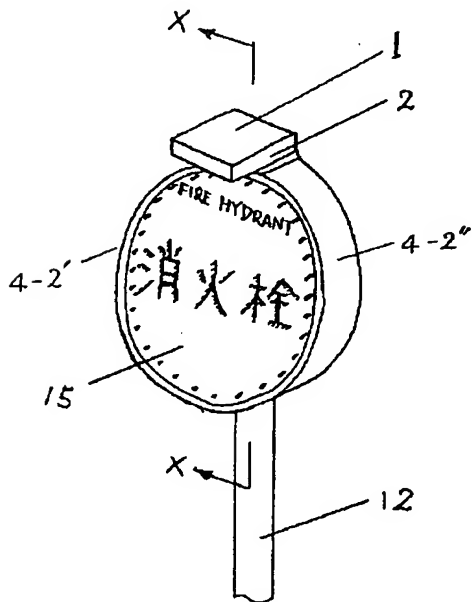
[Drawing 2]



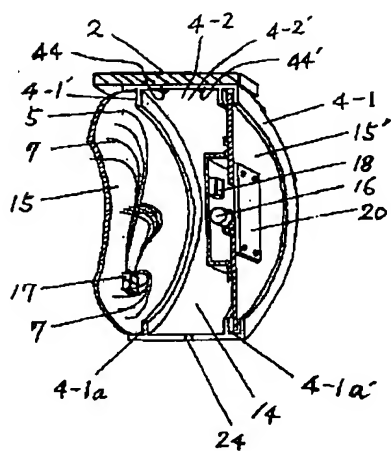
[Drawing 3]



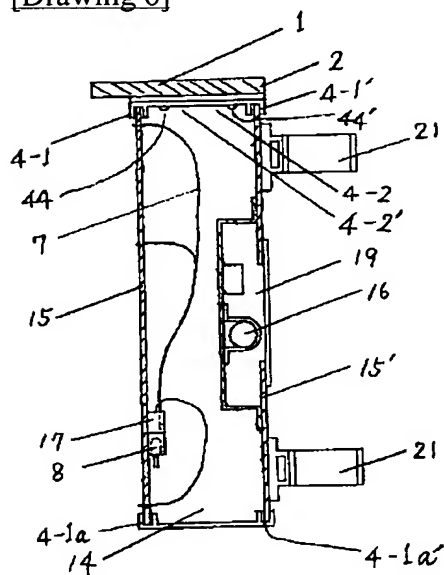
[Drawing 4]



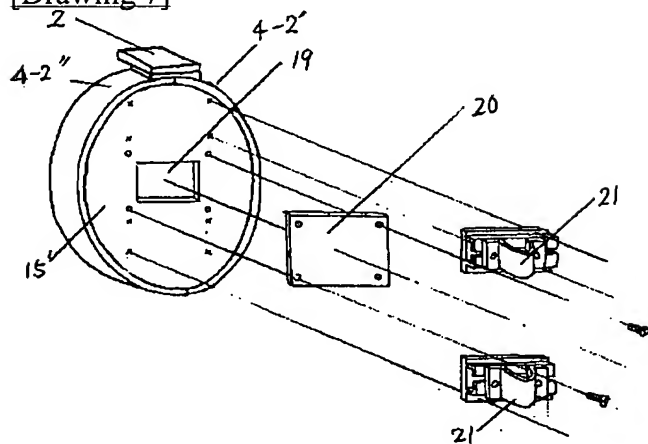
[Drawing 5]



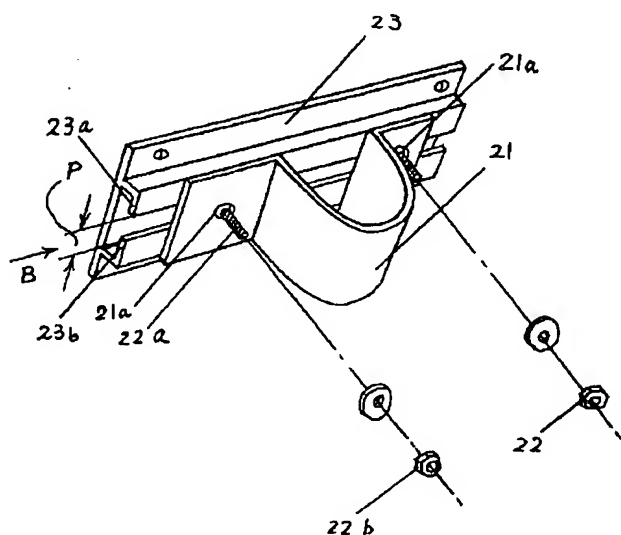
[Drawing 6]



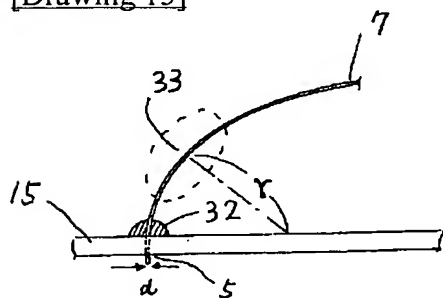
[Drawing 7]



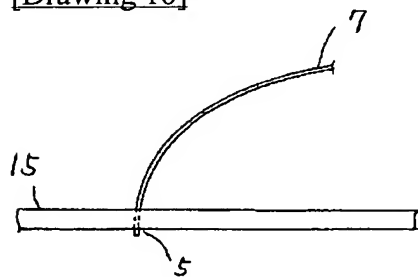
[Drawing 8]



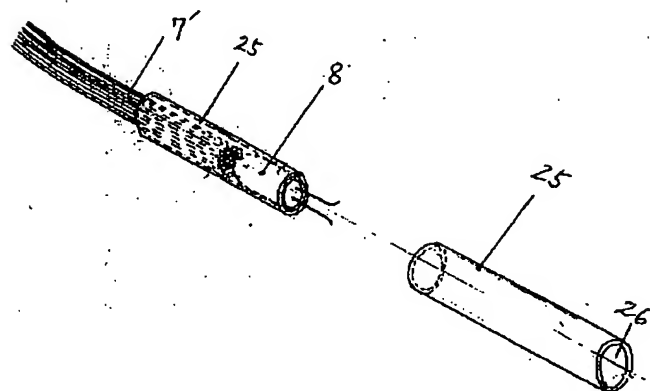
[Drawing 15]



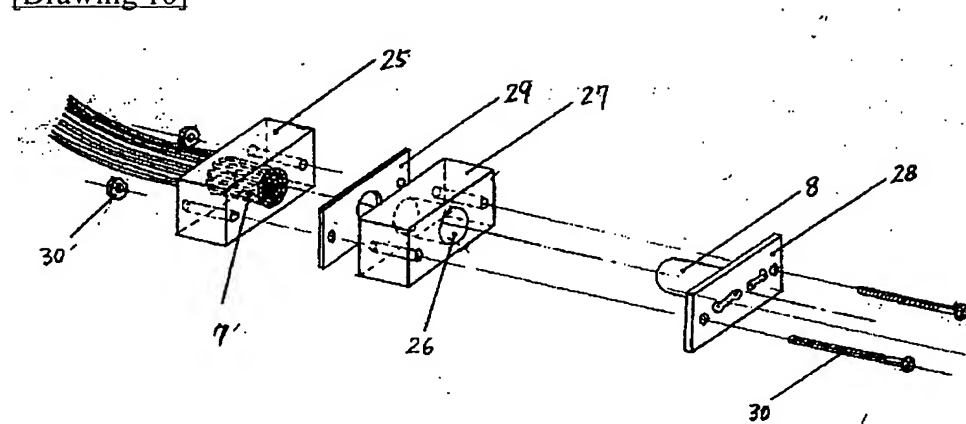
[Drawing 16]



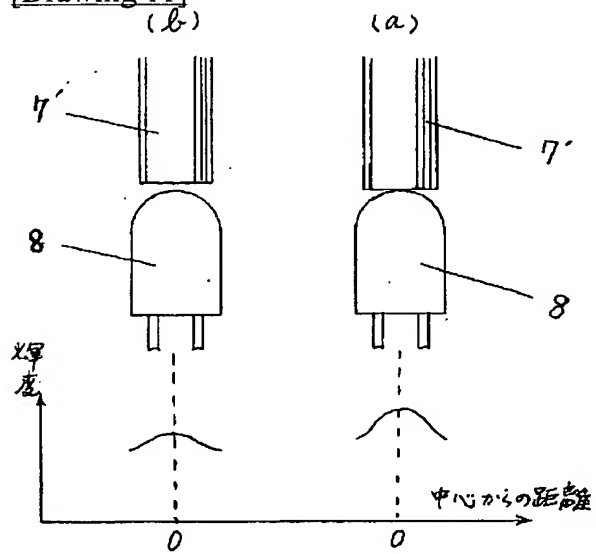
[Drawing 9]



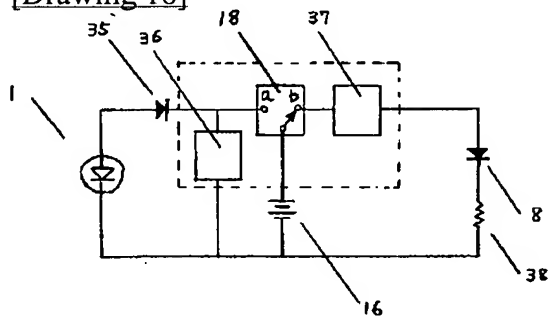
[Drawing 10]



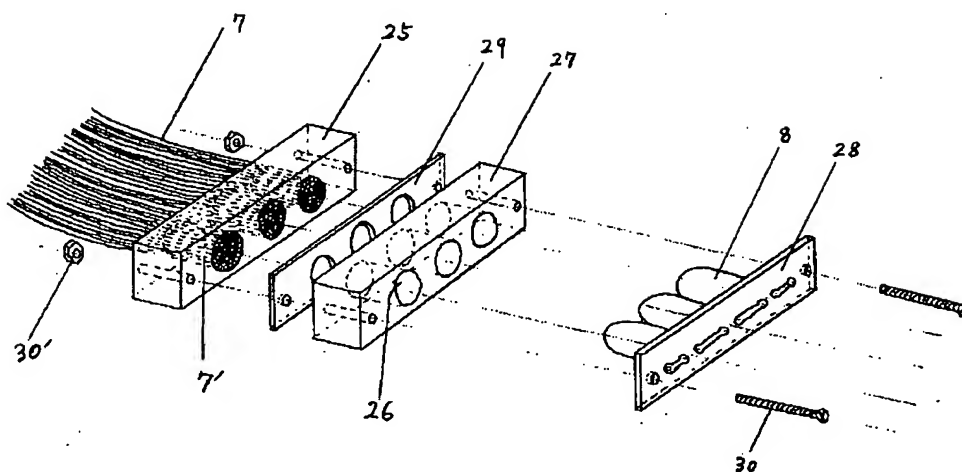
[Drawing 11]



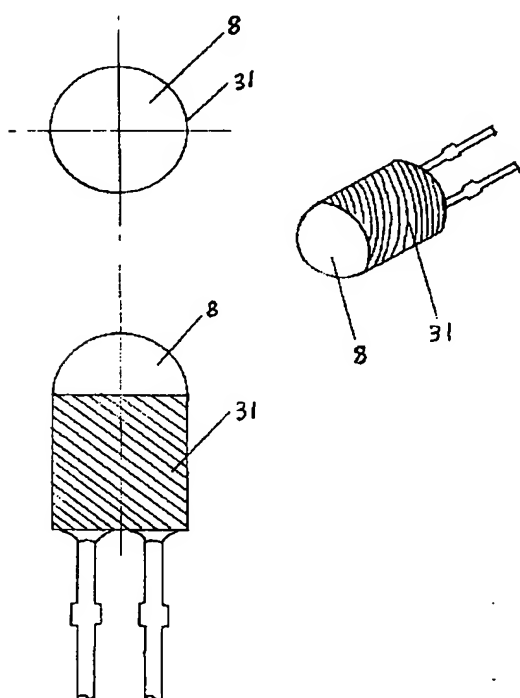
[Drawing 18]



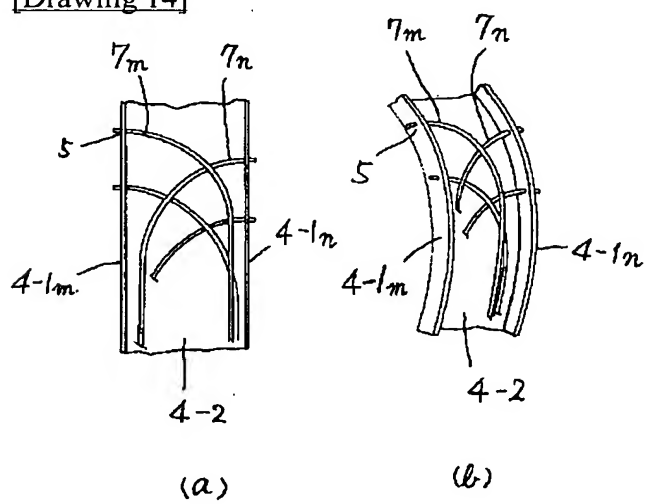
[Drawing 12]



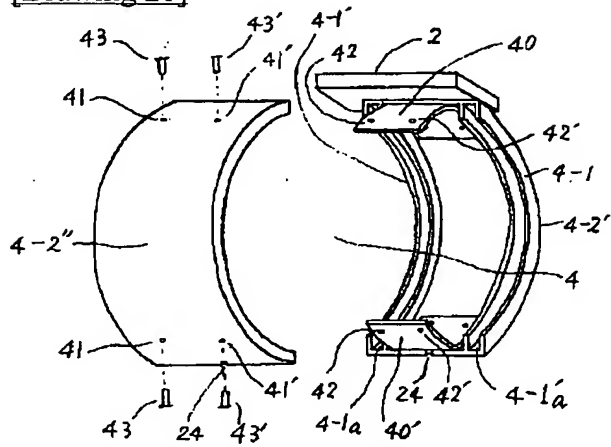
[Drawing 13]



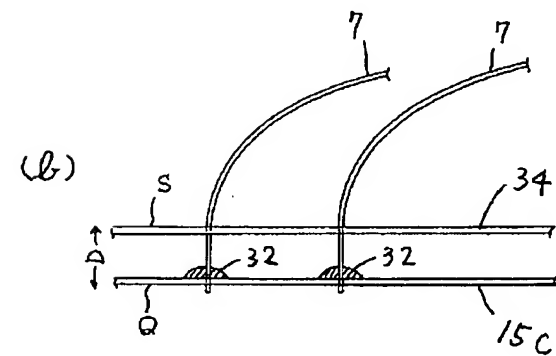
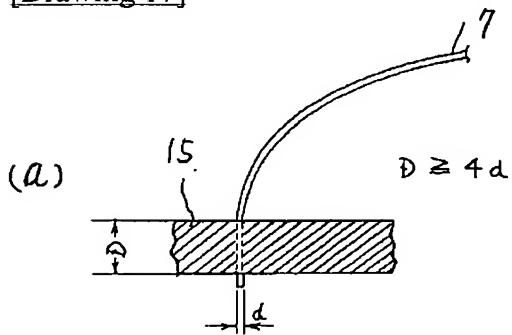
[Drawing 14]



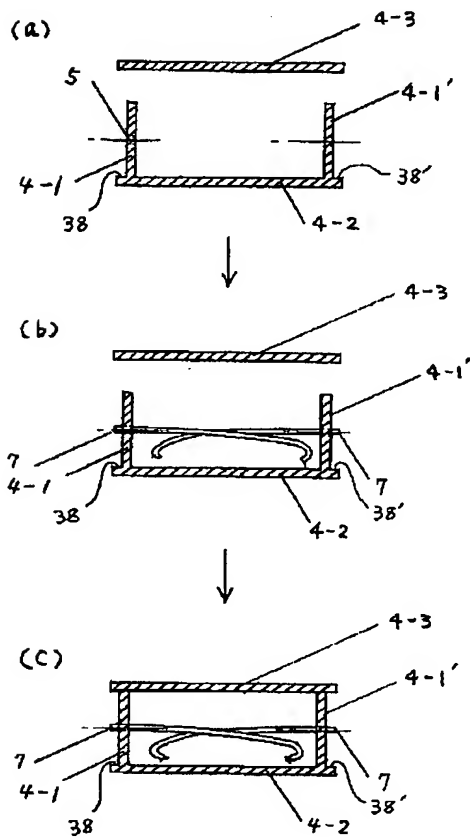
[Drawing 21]



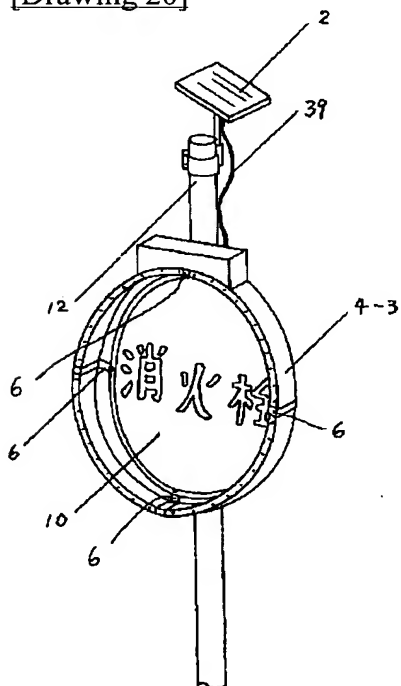
[Drawing 17]



[Drawing 19]



[Drawing 20]



[Translation done.]

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WRITTEN AMENDMENT

[Procedure amendment]

[Filing Date] November 17, Heisei 6

[Procedure amendment 1]

[Document to be Amended] Description

[Item(s) to be Amended] Claim 1

[Method of Amendment] Modification

[Proposed Amendment]

[Claim 1] Optical leakage control equipment for connection of an optical fiber and a light emitting diode equipped with the light emitting diode by which insertion immobilization is carried out into this breakthrough with the predetermined minute gap for optical diffusion in the opposite location of the edge of the holder made of synthetic resin which equips the inner skin of a breakthrough with light reflex material, two or more optical-fiber bundles fixed to this breakthrough, and the optical-fiber bundle by which insertion immobilization was carried out at said breakthrough.

[Procedure amendment 2]

[Document to be Amended] Description

[Item(s) to be Amended] 0048

[Method of Amendment] Modification

[Proposed Amendment]

[0048] In addition, from the internal-surface side of an inside tube-like object (4-2), the back end edge of an optical fiber 7 can be made to be able to project to an external wall surface side, and can also be blinked. Furthermore, if it explains in full detail, in the condition of having equipped the periphery of the fire hydrant indicator plate 10 with the inside tube-like object (4-2), the edge of an optical fiber 7 can be made to be able to project from the location by the side of the internal surface of the inside tube-like object (4-2) of the fire hydrant indicator plate 10 which carries out abbreviation opposite by turned and coming out at the periphery of the fire hydrant indicator plate 10, and light can also be blinked. Moreover, arrangement of a tube-like object (4-2) and the lidding object 4-3 is made into reverse, a tube-like object (4-2) can also be arranged outside, and the lidding object 4-3 can also be arranged inside. Furthermore, as shown in drawing 20, by enlarging the bore of a tube-like object (4-2), the arm fixing metal 6 can be attached and placed inside a tube-like object (4-2), and the arm fixing metal 6 can also be attached to the outer frame of the existing fire hydrant indicator plate 10 direct picking again.

[Procedure amendment 3]

[Document to be Amended] Description

[Item(s) to be Amended] 0051

[Method of Amendment] Modification

[Proposed Amendment]

[0051] This invention can raise the visibility of the indicator plate 10 using the light emitting diode of a **** fraction by carrying out amplification arrangement of the point emitting light with an optical fiber in the solid location of arbitration in this way. In order that this invention person might confirm visibility at night, he changed various consumed electric currents of the diameter of an optical fiber, arrangement spacing, and light emitting diode, and conducted the experiment which compares brightness visually from the distance of 100 (m) at night. Consequently, it was confirmed by making it blink in the above-mentioned arrangement attachment size using two light emitting diodes of 5000 (mcd) of a diameter 10 (mm) that it is sufficiently brightly rich in visibility. Since the power consumption of light emitting diode can be reduced to about 0.07 (w) and the above-mentioned arrangement attachment conditions can be provided with the solar

battery of the output of about 0.4 (W), the economical effectiveness is large.

[Procedure amendment 4]

[Document to be Amended] Description

[Item(s) to be Amended] 0058

[Method of Amendment] Modification

[Proposed Amendment]

[0058] Moreover, as shown in drawing 21 , in order to make coalesce connection of half-tube-like object (4-2)' and "(4-2), A way is contacted among ". the inner surface of half-tube-like object (4-2)'(4-2)", and abbreviation -- the connection plate 40 made from aluminum which has the same curvature and which was formed independently beforehand, and 40' -- half-tube-like object (4-2)' (4-2) -- half-tube-like object (4-2)' (4-2) -- an eyelet 43 and 43' are inserted in the mounting hole 41 of ", 41' and the connection plate 40, the mounting hole 42 of 40', and 42', and it fixes to them. before [moreover,] the solar-battery rack 2 attaches a solar cell module 1 -- the solar-battery rack 2 and a half-tube-like object (4-2) -- an eyelet (not shown) is inserted in the mounting hole (not shown) which was alike, respectively and was prepared where '(4-2) "and the connection plates 40 and 40' are piled up, and it fixes to it.

[Procedure amendment 5]

[Document to be Amended] Description

[Item(s) to be Amended] 0059

[Method of Amendment] Modification

[Proposed Amendment]

[0059] even if it is in drawing 6 and drawing 7 , before [moreover,] attaching a solar cell module 1 in the solar-battery rack 2 similarly -- the solar-battery rack 2 -- half--- an eyelet 44 and 44' are inserted in the mounting hole (not shown) which was alike, respectively and was prepared where tube-like object (4-2)'(4-2)" is piled up, and it fixes to it.

[Procedure amendment 6]

[Document to be Amended] Description

[Item(s) to be Amended] Claim 14

[Method of Amendment] Modification

[Proposed Amendment]

[Claim 14] (a) the [which is arranged in the ends by the side of the inner direction by carrying out phase opposite / water proof combination] -- the half-tube-like object of a couple with which the 1 2nd support piece was prepared with the envelopment object by which phase opposite combination ***** is carried out (b) The 1st panel by which two or more bores were prepared, and the indicator display was prepared while being fixed to said 1st support piece of this envelopment object, (c) -- the 2nd panel fixed to said 2nd support piece of said envelopment object, and (d) -- the [said / an envelopment object and / said] -- with the stowage formed from the 1 2nd panel (e) Two or more optical fibers by which insertion immobilization is carried out at two or more bores by which it was contained by this stowage and the end was prepared at least in one side of said 1st or 2nd panel, respectively, (f) Light emitting diode which is contained by this stowage, is adjoined and arranged in the focusing other end edge from which it converged mutually and the other end of two or more of said optical fibers was cut, and is equipped with an optical leakage control means, (g) It is the spontaneous light display with which the 2nd panel is equipped with the power source for supply of this light emitting diode, and the (h) aforementioned envelopment *****, and this envelopment ***** is equipped with the fixing metal fixed to the 2nd panel.

[Procedure amendment 7]

[Document to be Amended] Description

[Item(s) to be Amended] Claim 29

[Method of Amendment] Modification

[Proposed Amendment]

[Claim 29] (a) the maintenance plate with which two or more bores were prepared, and (b) -- the optical fiber with which it is beforehand bent by heating incubation of predetermined time with curvature predetermined by the position from an end, and this end is ****(ed) by the bore of said maintenance plate, and (c) -- a spontaneous light display equipped with the light emitting diode which adjoins the other end of said optical fiber and is arranged, and the power source for supply of (d) this light emitting diode.

----- [procedure amendment]

[Filing Date] February 8, Heisei 7

[Procedure amendment 1]

[Document to be Amended] Description

[Item(s) to be Amended] Claim

[Method of Amendment] Modification

[Proposed Amendment]

[Claim(s)]

[Claim 38] (a) The envelopment object with which the stowage was established in the interior and two or more bores were prepared, (b) Two or more optical fibers with which it is contained by said stowage and insertion immobilization of the end is carried out at two or more bores, respectively, (c) The other end of said fiber is adjoined, and it is arranged, and is **. Spontaneous light display for indicator designation of a fire hydrant equipped with the fixing metal with which light emitting diode equipped with a **** leakage control means, the power source for supply of (d) this light emitting diode, and the (e) aforementioned envelopment object are equipped and which fixes an envelopment object etc.

[Claim 39] The optical leakage control means of said light emitting diode is a spontaneous light display according to claim 38 which is the electroless deposition performed to the coat side face of this diode.

[Claim 40] the optical leakage control means of the light emitting diode adjoined and arranged in the focusing other end edge of said optical fiber and this optical fiber -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 38 which is optical leakage control equipment given in 13.

[Claim 41] Said power source for supply is a spontaneous light display according to claim 38 which is the solar battery arranged in the solar-battery rack with which any one of said envelopment object or the contiguity fixed objects which were established independently beforehand is equipped.

[Claim 42] claims 38, 39, and 40 characterized by established fire hydrant indicator ***** attaching an envelopment object in a fire hydrant indicator blanking attachment arm with said fixing metal -- being certain -- it is -- a spontaneous light display given in 41.

----- [procedure amendment]

[Filing Date] April 6, Heisei 7

[Procedure amendment 1]

[Document to be Amended] Description

[Item(s) to be Amended] Claim

[Method of Amendment] Modification

[Proposed Amendment]

[Claim(s)]

[Claim 1] Optical leakage control equipment for connection of an optical fiber and a light emitting diode equipped with the light emitting diode by which insertion immobilization is carried out into this breakthrough with the predetermined minute gap for optical diffusion in the opposite location of the edge of the holder made of synthetic resin which equips the inner skin of a breakthrough with light reflex material, two or more optical-fiber bundles fixed to this breakthrough, and the optical-fiber bundle by which insertion immobilization was carried out at said breakthrough.

[Claim 2] Light reflex material is optical leakage control equipment according to claim 1 which is electroless deposition.

[Claim 3] Light reflex material is optical leakage control equipment according to claim 1 which is the reflective sheet inserted in the inner skin of a breakthrough.

[Claim 4] Light reflex material is optical leakage control equipment according to claim 1 which is metallic thin plates, such as aluminum inserted in the inner skin of a breakthrough.

[Claim 5] The fiber holder made of synthetic resin with which at least one breakthrough was prepared, The light emitting diode holder made of synthetic resin which at least one breakthrough is prepared in the opposite location of the edge of two or more optical-fiber bundles by which insertion immobilization is carried out, and the optical-fiber bundle by which insertion immobilization was carried out at said breakthrough at this breakthrough, and equips the inner skin of this breakthrough with light reflex material, Optical leakage control equipment for connection of an optical fiber and a light emitting diode equipped with a fixed means to bind tight the light emitting diode by which insertion immobilization is carried out, and said fiber holder and light emitting diode holder to the breakthrough of this light emitting diode holder, and to fix to it.

[Claim 6] Optical leakage control equipment according to claim 5 which equips the inner skin of the

breakthrough of a fiber holder with light reflex material.

[Claim 7] claim 5 whose light reflex material is electroless deposition -- being certain -- it is -- optical leakage control equipment given in 6.

[Claim 8] claim 5 whose light reflex material is a reflective sheet -- being certain -- it is -- optical leakage control equipment given in 6.

[Claim 9] claim 5 whose light reflex material is metallic thin plates, such as aluminum, -- being certain -- it is -- optical leakage control equipment given in 6.

[Claim 10] claims 5, 6, 7, and 8 which made packing for protection from light-cum-light reflexes intervene between a fiber holder and a light emitting diode holder -- being certain -- it is -- optical leakage control equipment given in 9.

[Claim 11] claims 5, 6, 7, 8, and 9 by which soldering immobilization of the light emitting diode is carried out at the copper foil on a printed circuit board -- being certain -- it is -- optical leakage control equipment given in 10.

[Claim 12] claims 5, 6, 7, 8, 9, and 10 which come to prepare the predetermined minute gap for optical diffusion between the front end side of a light emitting diode, and the opposed face of the edge of an optical fiber -- being certain -- it is -- optical leakage control equipment given in 11.

[Claim 13] claims 5, 6, 7, 8, 9, 10, and 11 which a fixed means becomes from a bolt and a nut -- being certain -- it is -- optical leakage control equipment given in 12.

[Claim 14] (a) the [which is arranged in the ends by the side of the inner direction by carrying out phase opposite / water proof combination] -- the half-tube-like object of a couple with which the 1 2nd support piece was prepared with the envelopment object by which phase opposite combination ***** is carried out (b) While being fixed to said 1st support piece of this envelopment object, two or more bores The 1st panel by which it was prepared and the indicator display was prepared, (c) -- the 2nd panel fixed to said 2nd support piece of said envelopment object, and (d) -- the [said / an envelopment object and / said] -- with the stowage formed from the 1 2nd panel (e) Two or more optical fibers by which insertion immobilization is carried out at two or more bores by which it was contained by this stowage and the end was prepared at least in one side of said 1st or 2nd panel, respectively, (f) Light emitting diode which is contained by this stowage, is adjoined and arranged in the focusing other end edge from which it converged mutually and the other end of two or more of said optical fibers was cut, and is equipped with an optical leakage control means, (g) It is the spontaneous light display with which the 2nd panel is equipped with the power source for supply of this light emitting diode, and the (h) aforementioned envelopment *****, and this envelopment ***** is equipped with the fixing metal fixed to the 2nd panel.

[Claim 15] (a) the [in which it was arranged in the ends of a tube-like object, and two or more bores were prepared / which carries out phase opposite] -- with the envelopment object possessing the 1 2nd support piece (b) -- the [said / a tube-like object and / said] -- with the cavity stowage formed from the 1 2nd support piece (c) Two or more optical fibers with which it is contained by this cavity stowage, and insertion immobilization of the end is carried out at one [at least] bores of two or more of said 1st or 2nd support piece, respectively, (d) Light emitting diode which is contained by said cavity stowage, and adjoins the other end of said fiber, and is arranged, and is equipped with an optical leakage control means, (e) -- the power source for supply of this light emitting diode, and (f) -- the lidding object which lids said cavity stowage, and (g) -- the spontaneous light display for indicator designation of a fire hydrant equipped with the fixing metal with which said lidding object or an envelopment object is equipped, and this lidding ***** fixes an envelopment object etc.

[Claim 16] The spontaneous light display according to claim 15 set as extent which few-***** rather than the end edge of the optical fiber with which either [at least] the extension which extended said tube-like object, or said lidding object projected from the bore of said support piece.

[Claim 17] claims 14 and 15 which are the electroless deposition by which the optical leakage control means of said light emitting diode was given to the coat side face of this diode -- being certain -- it is -- a spontaneous light display given in 16.

[Claim 18] the optical leakage control means of the light emitting diode adjoined and arranged in the focusing other end edge of said optical fiber and this optical fiber -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- claims 14 and 15 which are optical leakage control equipment given in 13 -- being certain -- it is -- a spontaneous light display given in 16.

[Claim 19] For said envelopment *****, said power source for supply is a spontaneous light display according to claim 14 which is the solar battery with which it is equipped on the solar-battery rack prepared in said 2nd panel.

[Claim 20] Said power source for supply is a spontaneous light display according to claim 15 which is the solar battery arranged in the solar-battery rack with which any one of said lidding object, said envelopment object, and the contiguity fixed objects established independently beforehand is equipped.

[Claim 21] claims 14, 17, and 18 prepared in the location where the removal hole for exchanging the battery contained by said stowage is prepared in said 2nd panel, and said fixing metal counters this removal hole -- being certain -- it is -- a spontaneous light display given in 19.

[Claim 22] claims 14, 17, 18, and 19 by which a battery and a flash circuit are built in in said stowage -- being certain -- it is -- a spontaneous light display given in 21.

[Claim 23] claims 15, 16, 17, and 18 by which a battery and a flash circuit are built in in said solar-battery rack -- being certain -- it is -- a spontaneous light display given in 20.

[Claim 24] claims 15, 16, 17, 18, and 20 characterized by said lidding ***** enabling installation of an envelopment object on an established fire hydrant indicator blanking attachment arm with said fixing metal - - being certain -- it is -- a spontaneous light display given in 23.

[Claim 25] (a) The 1st maintenance plate and the 2nd maintenance plate which two or more bores are prepared, and carry out phase opposite, and are arranged at the predetermined spacing, (b) The 1st optical fiber with which it is arranged [abbreviation], and is bent with predetermined curvature [near the inner surface of said 1st maintenance plate], and an end is ****(ed) by each bore of said 2nd maintenance plate, (c) It is arranged so that said 1st optical fiber may be intersected, while being arranged [abbreviation] [near the inner surface of said 2nd maintenance plate]. and the 2nd optical fiber with which it is bent with predetermined curvature and an end is ****(ed) by each bore of said 1st maintenance plate and (d) -- the [said] -- a spontaneous light display equipped with the light emitting diode which adjoins the other end of the 1 2nd optical fiber, and is arranged, and the power source for supply of (e) this light emitting diode.

[Claim 26] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 25 which uses the optical leakage control equipment of a publication for 13.

[Claim 27] (a) the maintenance plate with which two or more bores were prepared, and (b) -- the optical fiber with which an end is ****(ed) by the bore of said maintenance plate, and (c), in order to carry out adhesion immobilization of this optical fiber at said maintenance plate The adhesives applied to the perimeter of the bore of said maintenance plate by which this optical fiber is ****(ed), and the periphery of this optical fiber, (d) Light emitting diode which adjoins the other end of said optical fiber and is arranged, (e) It has the power source for supply of this light emitting diode, and has predetermined curvature for said optical fiber with an external pressure by the position from the end of said optical fiber fixed to said maintenance plate. Bending, The spontaneous light display which predetermined time heating of the bending part by said external pressure of said optical fiber is carried out [display], and makes it come to decrease the stress by the bending distortion of the bending part of the optical fiber by said external pressure.

[Claim 28] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 27 which uses the optical leakage control equipment of a publication for 13.

[Claim 29] (a) the maintenance plate with which two or more bores were prepared, and (b) -- the optical fiber with which it is beforehand bent by heating incubation of predetermined time with curvature predetermined by the position from an end, and an end is ****(ed) by the bore of said maintenance plate, and (c) -- a spontaneous light display equipped with the light emitting diode which adjoins the other end of said optical fiber and is arranged, and the power source for supply of (d) this light emitting diode.

[Claim 30] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 29 which uses the optical leakage control equipment of a publication for 13.

[Claim 31] claims 27, 28, and 29 which will be characterized by bending an optical fiber with the curvature of $70d \leq r < 100d$ if the bend radii of d and an optical fiber are set to r for the diameter of said optical fiber - - being certain -- it is -- a spontaneous light display given in 30.

[Claim 32] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 31 which uses the optical

leakage control equipment of a publication for 13.

[Claim 33] (a) The maintenance plate with which a predetermined distance was separated or it installed directly, and the accessory plate was arranged and two or more bores were prepared also in this accessory plate, (b) The optical fiber with which an end is ****(ed) by the bore of said maintenance plate, and light emitting diode which adjoins the other end of the (c) aforementioned optical fiber, and is arranged, (d) Spontaneous light display which was equipped with the power source for supply of this light emitting diode, and made $D \geq 4d$ of distance from the outside surface of a maintenance plate to the outside surface of an accessory plate like when setting the diameter of D and an optical fiber to d.

[Claim 34] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 33 which uses the optical leakage control equipment of a publication for 13.

[Claim 35] said accessory plate -- a maintenance plate and abbreviation -- the spontaneous light display according to claim 33 characterized by having the same coefficient of thermal expansion.

[Claim 36] as the optical leakage control means for connection with the light emitting diode which adjoins the other end and this other end of said optical fiber, and is arranged -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 35 which uses the optical leakage control equipment of a publication for 13.

[Claim 37] claim 14 which prepared the drain hole in the lower part of said envelopment object -- being certain -- it is -- a spontaneous light display given in 15.

[Claim 38] (a) The envelopment object with which the stowage was established in the interior and two or more bores were prepared, (b) Two or more optical fibers with which it is contained by said stowage and insertion immobilization of the end is carried out at two or more bores, respectively, (c) The other end of said fiber is adjoined, and it is arranged, and is **. Spontaneous light display for indicator designation of a fire hydrant equipped with the fixing metal with which light emitting diode equipped with a **** leakage control means, the power source for supply of (d) this light emitting diode, and the (e) aforementioned envelopment object are equipped and which fixes an envelopment object etc.

[Claim 39] The optical leakage control means of said light emitting diode is a spontaneous light display according to claim 38 which is the electroless deposition performed to the coat side face of this diode.

[Claim 40] the optical leakage control means of the light emitting diode adjoined and arranged in the focusing other end edge of said optical fiber and this optical fiber -- claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, and 12 -- being certain -- it is -- the spontaneous light display according to claim 38 which is optical leakage control equipment given in 13.

[Claim 41] Said power source for supply is a spontaneous light display according to claim 38 which is the solar battery arranged in the solar-battery rack with which any one of said envelopment object or the contiguity fixed objects which were established independently beforehand is equipped.

[Claim 42] claims 38, 39, and 40 characterized by established fire hydrant indicator ***** attaching an envelopment object in a fire hydrant indicator blanking attachment arm with said fixing metal -- being certain -- it is -- a spontaneous light display given in 41.

[Translation done.]

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